Service Manual

V Series
Patient Monitors

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Foreword

The **V Series** Service Manual is intended as a guide for technically qualified personnel during repair and calibration procedures.

Unauthorized servicing may void the remainder of the warranty. Check with the factory or with a local authorized representative to determine the warranty status of a particular instrument.

The **V 12/V 21** operates on line voltages. Therefore, an electric shock hazard may exist when the instrument covers are removed. Repair and calibration procedures should only be performed by qualified personnel who proceed with care and follow proper servicing techniques. Warnings are given in various chapters, as well as in other appropriate locations.

How to Use This Guide

This guide is divided into eight sections. Navigate through the table of contents at the left of the screen to select the desired topic. Links to other relevant sections are also provided within the individual topics. In addition, scrolling through the topics with the page up and page down keys is also possible.

Passwords

A password may be required to access different modes within the monitor. The default passwords are listed below:

Service Mode: SERVICE

System Setup: SYSTEM

Warnings, Cautions and Notes

Read and adhere to all of the warnings and cautions listed throughout this manual.

A **WARNING** is provided to alert the user to potentially serious outcomes (death, injury or serious adverse events) to the patient or the user.

A **CAUTION** is provided to alert the user that special care should be taken for the safe and effective use of the device. They will include actions to be taken to avoid effects on patients or users that will not be potentially life threatening or result in serious injury, but about which the user should be aware.

A **NOTE** is provided when additional general information is available.

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1.0 Theory of Operation

1.1 Introduction

The **V 12/V 21** is a modular patient monitoring system. The system architecture allows users to customize, by removal or addition of modules, monitored parameters based on a patient's monitoring need or acuity level. The modular design simplifies the addition of monitoring additional parameters with the addition of parameter modules.

The **V 12/V 21** focuses on the philosophy of " Ease of Use" while incorporating traditionally highly complex monitoring parameters. The user interface minimizes menu layers and excessive user interaction to simplify patient care. The **V 12/V 21** maximizes the amount of viewable data through the use of a portrait display orientation.

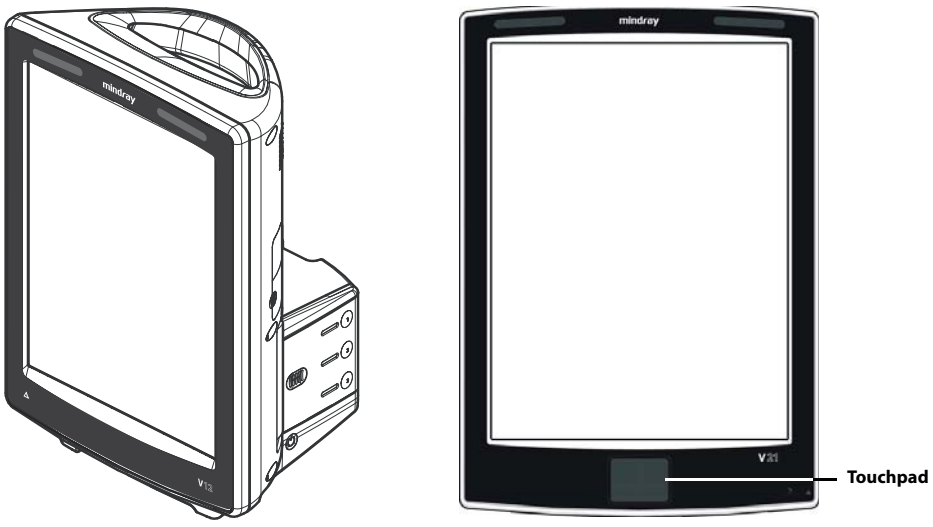


FIGURE 1-1 Example **V 12/V 21** Patient Monitor

1.2 Connectors for Peripheral Devices and Indicators

This section describes all the connectors for peripheral devices and indicators.

1.2.1 Connectors for Peripheral Devices

V 12 and **V 21**

V 12 and **V 21** refer to the 12.1" monitor and 21.3" monitor respectively.

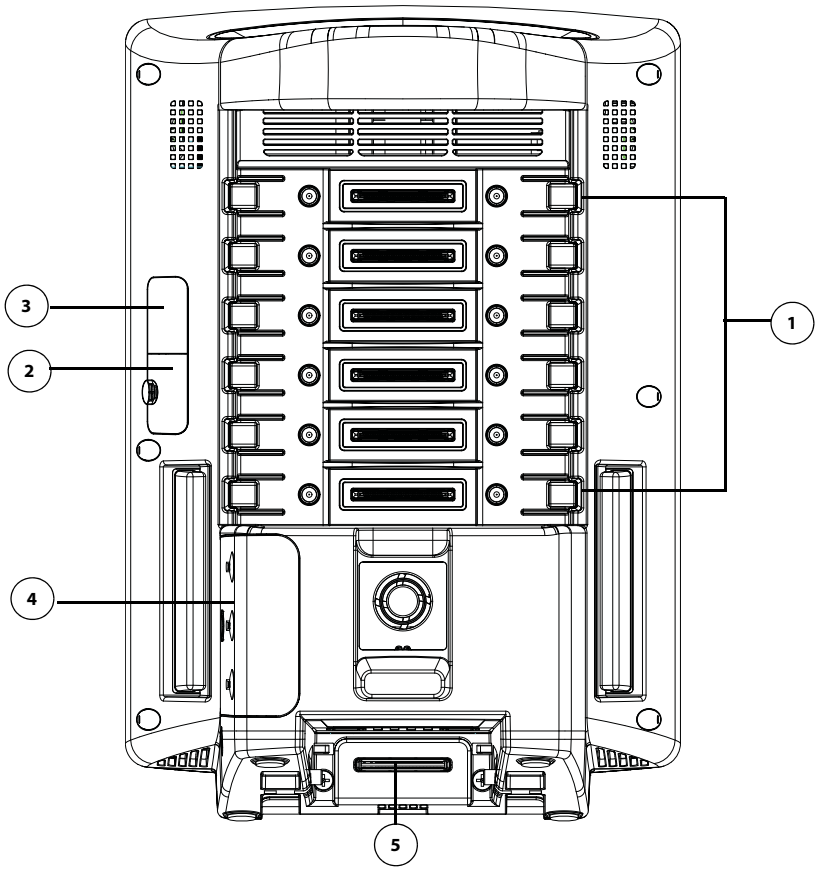


FIGURE 1-2 Example **V 12** Rear View

1. Integrated module bays (for **V 12** only) : Provides six module bays for modules and can accommodate any combination of one, two or three bay wide modules that total six or less bays.
2. V Hub connector: Connects V Hub via a PUSB cable.
3. RS-232 debug port: Connects a PC and is used for debug.
4. Battery connector (for **V 12** only): Contains 3 battery connectors for removable batteries.
5. V Dock connector: Provides quick connection and release with components during stationary operation.

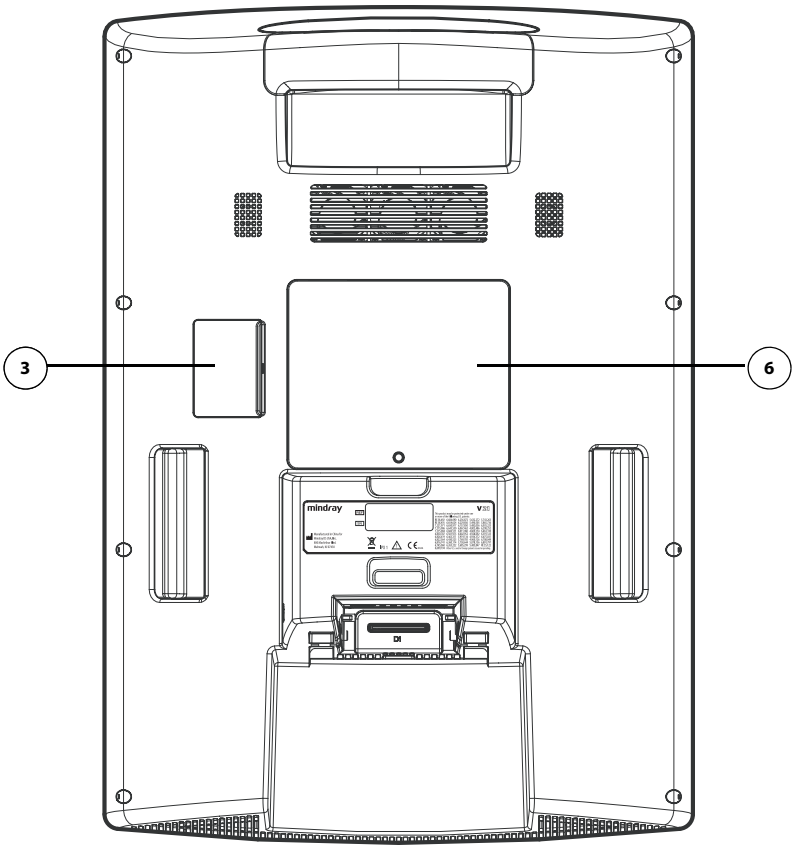


FIGURE 1-3 Example **V 21** Rear View

3. RS-232 debug port: Connects a PC and is used for debug.

6. SATA connector (for **V 21** only): Connects SATA driver (optional).

V Dock Physical Views

Front View

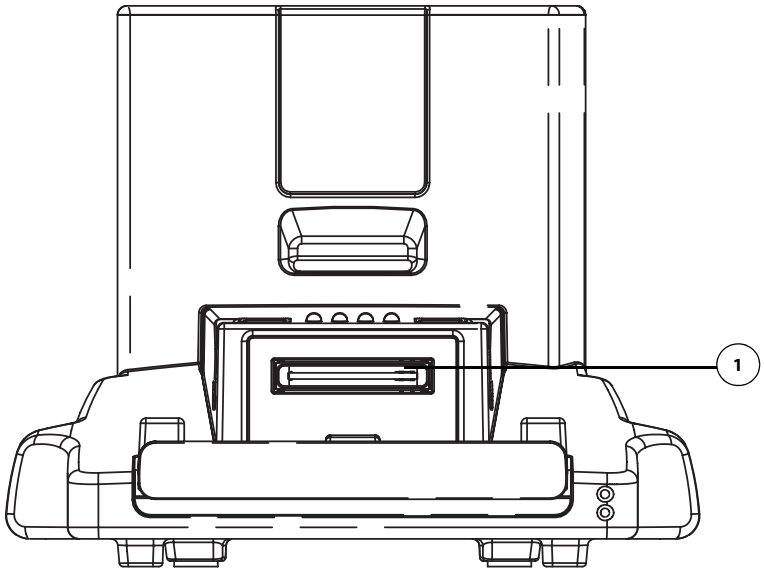


FIGURE 1-4 Example V Dock Front View

1. V Dock connector: Interfaces to a **V 12** or **V 21** monitor which allows for power and data communication.

Rear View

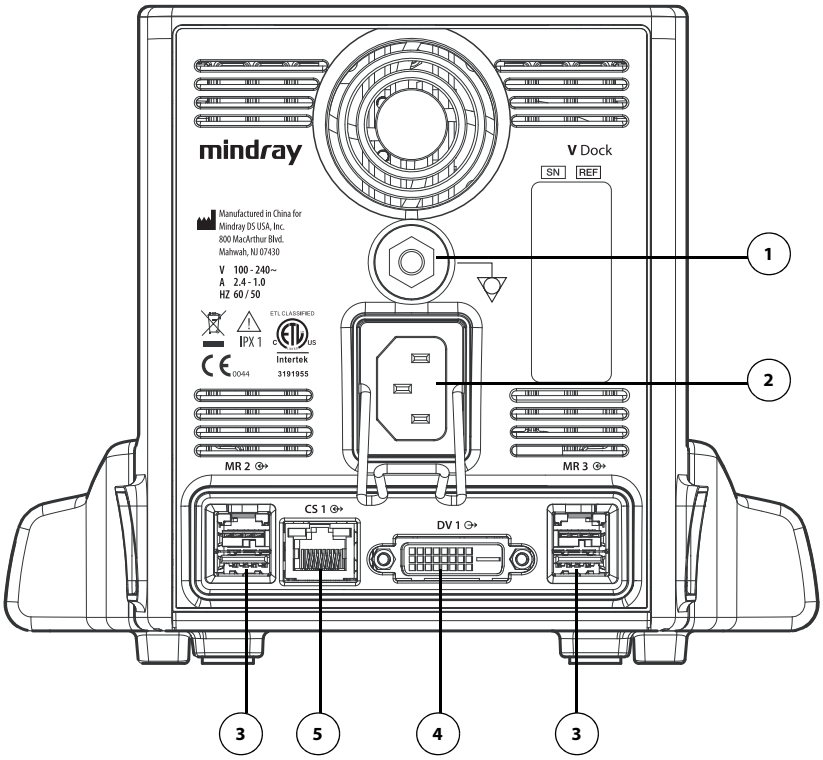


FIGURE 1-5 Example V Dock Rear View

1. Equipotential lug: Connects the equipotential lug of other equipment when the monitor is used with other equipment, eliminating the potential difference between them.
2. AC receptacle: Connects an AC power source (100-240 VAC, 50/60 Hz).
3. V Hub connector (3): Connects V Hub via PUSB cables.
4. Digital video interface (DVI) connector: Connects a second display via a DVI cable.
5. Central station (CS) connector: A RJ45 connector, through which a network or PC can be connected.

Right Side View

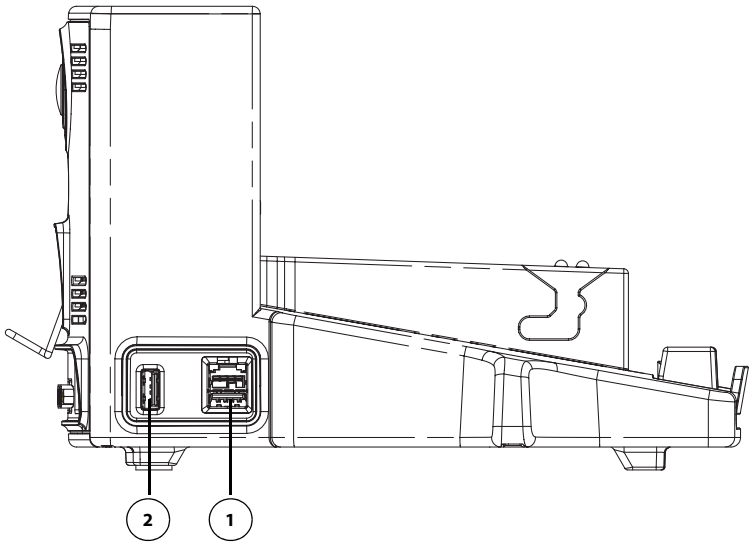


FIGURE 1-6 Example V Dock Right Side View

1. V Hub connector (3): Connects V Hub via PUSB cables.
2. Standard USB connector or serial bus (3): Connects external USB devices.

Left Side View

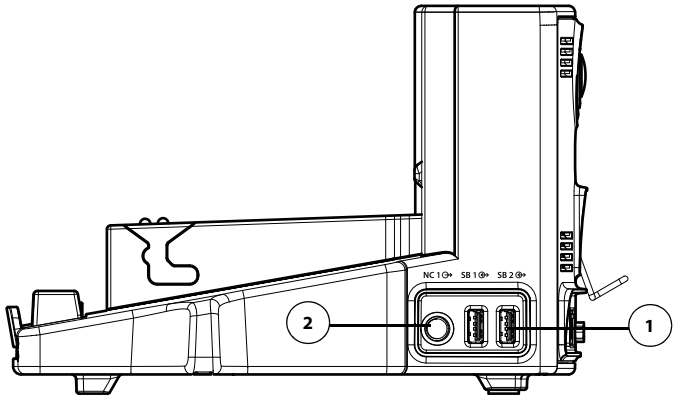


FIGURE 1-7 Example V Dock Left Side View

1. Standard USB connector or serial bus (3): Connects external USB devices.
2. Nurse call: Connects nurse call relay.

V Hub Physical View

Front View

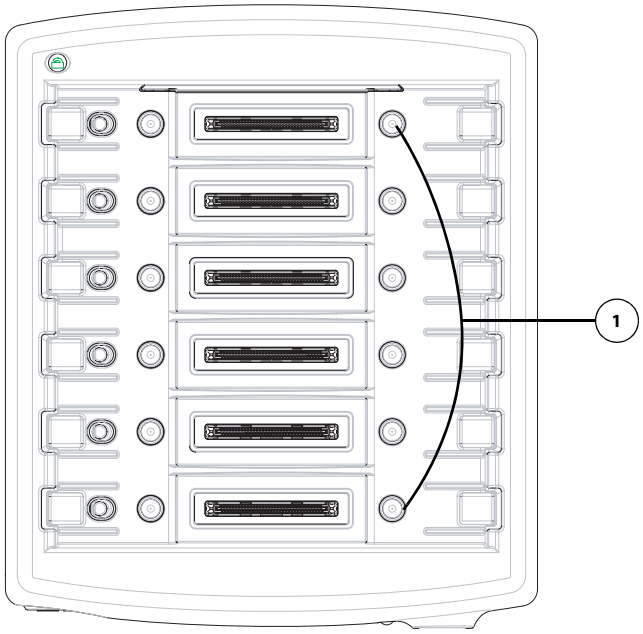


FIGURE 1-8 Example V Hub Front View

1. Integrated module bay (6): Accommodates any combination of one, two, or three bay wide modules that totals six or less bays. It allows for power and data communication to modules.

Bottom View

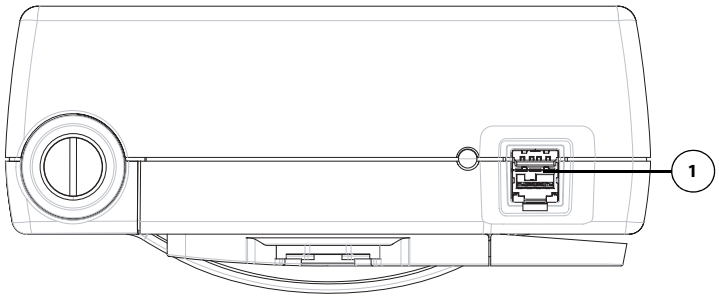


FIGURE 1-9 Example V Hub Bottom View

1. V Hub connector: Allows for power and data communication to the monitor or V Dock.

1.2.2 Indicators

Module Indicator

Each module has one indicator. The status indicator is a single bi-color LED (green/amber).

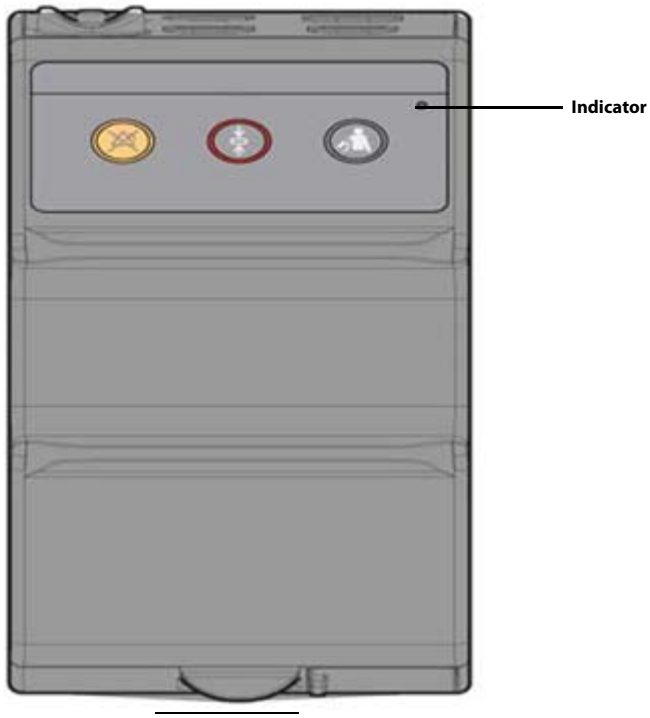
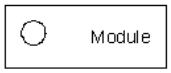


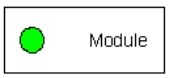
FIGURE 1-10 Example VPS Front View

The status indicator shows three kinds of status levels.



Indicates unconnected and no power.

Indicates USB power and no communication. When a module is connected, the amber LED illuminates to indicate that USB power is available to the module, but there is no communication.



Indicates fully functional and proper communication. Once the V Hub communicates and is identified, the LED turns green.

V Hub Indicator

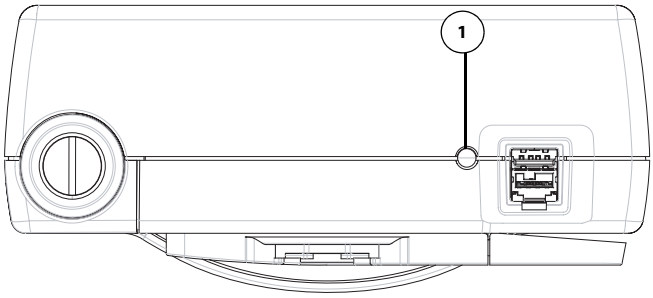


FIGURE 1-11 Example V Hub Indicator

1. Indicates the 12 Volt and 5 Volt power status of V Hub. When the V Hub indicator is off, it indicates power source disconnection. When the V Hub indicator is lit in yellow, 5V is normal but 12V is abnormal. When the V Hub indicator is lit in green, 12V is normal.

Battery Indicator

Battery indicators (for **V 12** only) show the capacity and the charging status of each battery.

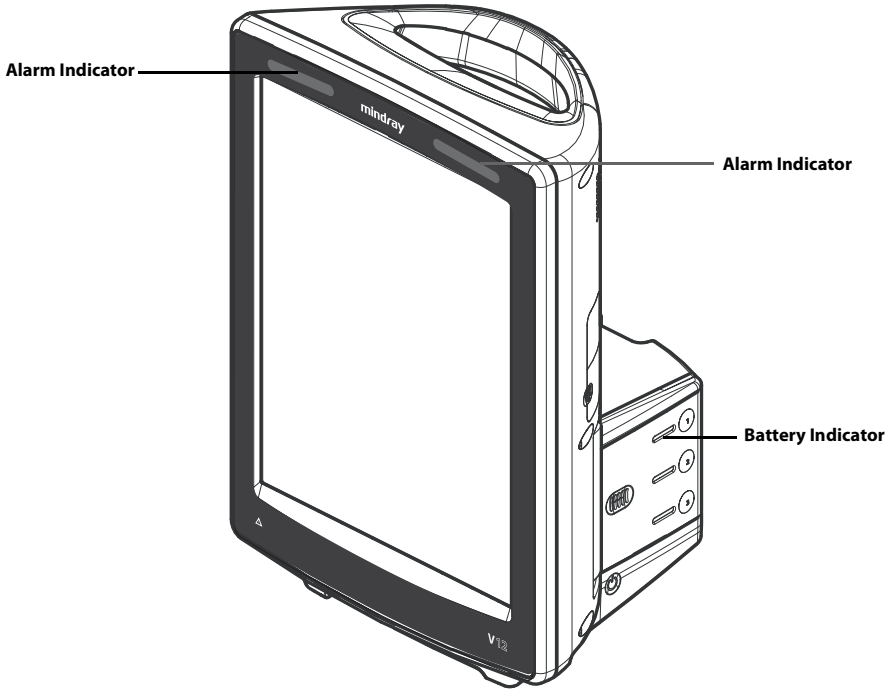


FIGURE 1-12 Example Battery Indicator

Alarm Indicator

Alarm indicators show the status of the patient monitor or patient. See FIGURE 1-12.

1.3 Main Unit

The patient monitor consists of :

- Input system: Touchscreen, touch pad, power button, keyboard/mouse
- Output system: LCD panel, alarm lamp, speaker, AC and battery status LEDs, recorder
- Processing and communications system: CPU module, monitor carrier board
- Power management system: Li-Ion battery, internal backup battery, battery interface board, AC-DC power board, power management board (PMB)
- Power interface system: Monitor carrier board, V Dock
- Equipment interface system: Monitor carrier board, V Dock , V Hub

In addition, the patient monitor can also utilize a USB storage device, USB mouse, USB keyboard, etc.

FIGURE 1-13 illustrates the architecture of **V 12/V 21** patient monitor.

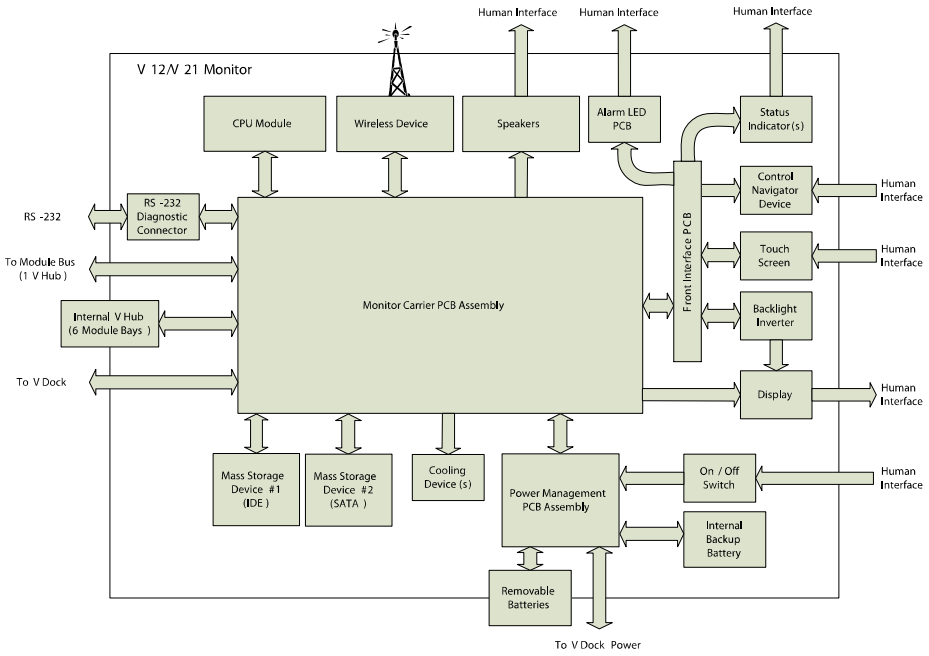


FIGURE 1-13 Electrical Architecture of **V 12/V 21**

1.3.1 Input System

Touchscreen

The touchscreen is operable with or without gloves and provides a recalibration function.

Touch Pad

The touch pad is only for the **V 21** and located at the lower part of the monitor's front panel.

Power Button

The power button is located at the lower right part of **V 12/V 21**. Pressing it will power the monitor on or off. The power button's status is detected by the power management board.

Keyboard / Mouse

USB keyboard and mouse is supported.

1.3.2 Output System

LCD Panel

The **V 21** display uses a 21.3" LCD screen with a resolution of 1600x1200. **V 12** display uses a 12.1" LCD screen with a resolution of 768x1024. The LCD panel gets signals from the main board and gets power from the inverter board, which is driven by the main board through the front interface connector board.

Alarm Lamp

The monitor has two groups of alarm lamps on the alarm LED board, which is on the front panel. The monitor I/O microprocessor passes the control signal to the LED driver TLC59116 via I2C bus.

Speaker

The speakers provide sound for alarms, heart beats, etc. They are driven by the COM Express Module and the monitor I/O carrier board.

AC and Battery Status LEDs

The AC and battery status LEDs, located on V Dock (docking station), are controlled by the AC-DC power board and PMB respectively. The PMB monitors battery status and passes the control signal to V Dock via connectors.

Recorder

The Recorder module is used to print locally to a thermal recorder. The recorder gets power and data from the V Hub through the non-Isolated module host communications board. The keypad/ LED is for indication and operation.

1.3.3 Processing and Communications System

The processing and communication system mainly consists of two boards: CPU module and monitor I/O carrier board.

CPU Module

The CPU module is a standard COM Express board, which is the heart of the patient monitor, and implements a series of tasks including display processing, system control, data storage, and processing, input and output system. The CPU module contains CPU, north-bridge, south-bridge, DDR2 RAM, real-time clock, EEPROM, etc. It interfaces to the carrier board only, which then provides interfaces to all other external devices.

Monitor Carrier Board

The monitor I/O carrier board is the CPU module's carrier board and will be described in detail in section1.3.5 Equipment Interface System on Page 1-14 and Page 1-15.

1.3.4 Power Management System

Li-Ion Battery

- Three removable li-ion batteries are available. The battery compartment door is located at the lower right of the patient monitor. The battery power is introduced to the power module via the battery interface board and then processed and distributed to **V 12** via the power management board.

Internal Backup Battery

- The monitor uses one single-cell li-ion backup battery (P/N: 022-000006-00 SANYO UR18650W high rate li-ion battery 3.7V 1500mAh). The battery is fixed to the battery interface board.

Battery Interface Board

- The battery interface board serves as an interface between the batteries and the power management board.

AC-DC Power Board

- The AC-DC power board converts input from AC power, and generates one regulated DC output of voltage 15V. The output is turned on/off via connection or disconnection of the AC power cord. The power supply provides an indication of AC presence.
- The Power Pin Board acts as a conduit for 12V and 15V to pass between the power supply and mid and high acuity versions of the **V Series** patient monitor.

Power Management Board (PMB)

This board is responsible for power management and performs the following functions:

- Auto-selects available power source (DS-DC, removable li-ion battery packs or internal li-ion backup battery).
- Provides three regulated DC output voltages: 12V, 5V and 3.3V.
- Detects the power switch status to turn on/off the outputs.
- Monitors the system status (PS_ON) to hold the power or to turn it off.
- Provides over-voltage, over-current and short-circuit protection for all outputs.
- Monitors the input voltage and current provided to, and the output voltage and current draw from each DC/DC converter output.
- Monitors the temperature of the PMB.
- Provides means to charge the three removable li-ion battery packs and the internal backup battery and provides a CHRGR_ACTIVE output signal.
- Provides a UART interface to communicate with monitor I/O board and passes the PMB information to monitor at a regular interval.

1.3.5 Equipment Interface System

Monitor Carrier Board

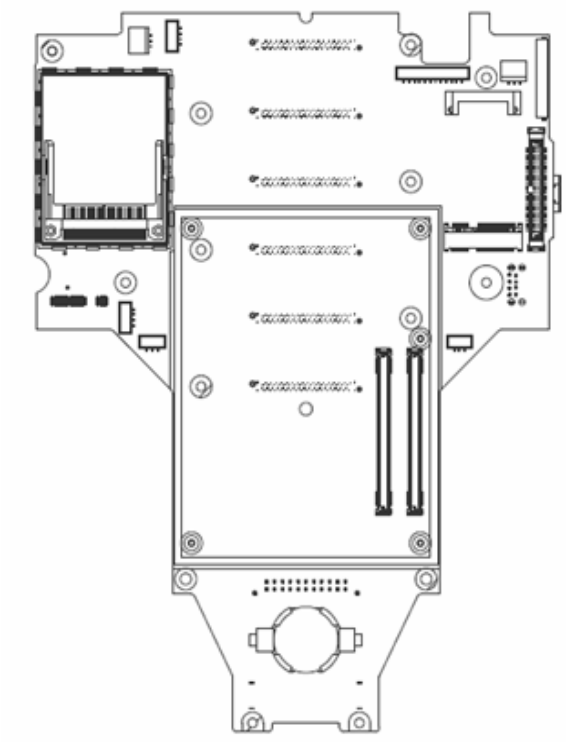


FIGURE 1-14 Monitor Carrier Board

The monitor carrier board implements the following tasks:

- Provides interfaces for CF, SATA, WiFi, LVDS display and so on.
- Communicates with PMB through UART and provides a debug serial port.
- Communicates with the CPU module through USB.
- Interfaces with I2C devices such as EEPROMs, the CPU module, alarm led drivers and Port Expander.
- Monitors temperatures, detects fan status and controls fan speed.
- Detects dock presence and implements power control.
- Controls backlight and display brightness.
- Detects V Hub status and implements power control.

V Dock

V Dock (docking station) mounts to a fixed location and provides electrical connections for network, power, USB, nurse call, display, and **V Series** module bus devices.

V Hub

V Hub provides the electrical interface between **V 12/V 21** patient monitor and parameter modules. It is used to extend the module bus to six module bays.

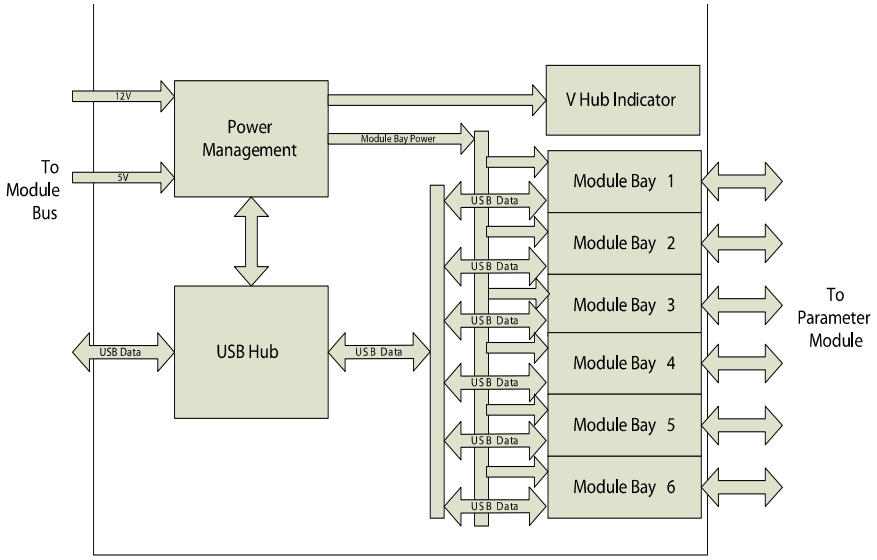


FIGURE 1-15 Electrical Architecture of V Hub

1.3.6 Interface Requirements

V Series Patient Monitor provides wired or wireless network interface to communicate with Panorama, Hypervisor, etc. Wireless card is in **V 12/V 21** and wired network connector is on the docking station.

1.3.7 Parameter Module

Parameter modules include VPS, Recorder, VDI, CO_2, C.O., IBP, TEMP,12L ECG/EKG, NIBP, SpO_2. Each parameter module consists of four parts: host communication board, keypad/LED, parameter board and instrument/patient connector board.

The NI-HCB or HCB is the interface between module bus and the parameter board, playing a role of power supply, data communication and processing. Parameter serves as the main source of patient parameter data. Instruments or sensors are connected to parameter modules via the instrument/patient connector board. Keypad/LED is for indication and operation.

VPS (V Patient Server)

The VPS is a collection of the most commonly measured parameters, including 3/5/6 Lead ECG, Respiration, Invasive Blood Pressure (2 channels), Temperature, SpO_2, Analog Output (2), and a Defibrillator Sync.

Otherwise the VPS also provides mass storage to store all patients' historical data and specific configuration data. It is a 3X module. FIGURE 1-16 shows the electrical architecture of VPS.

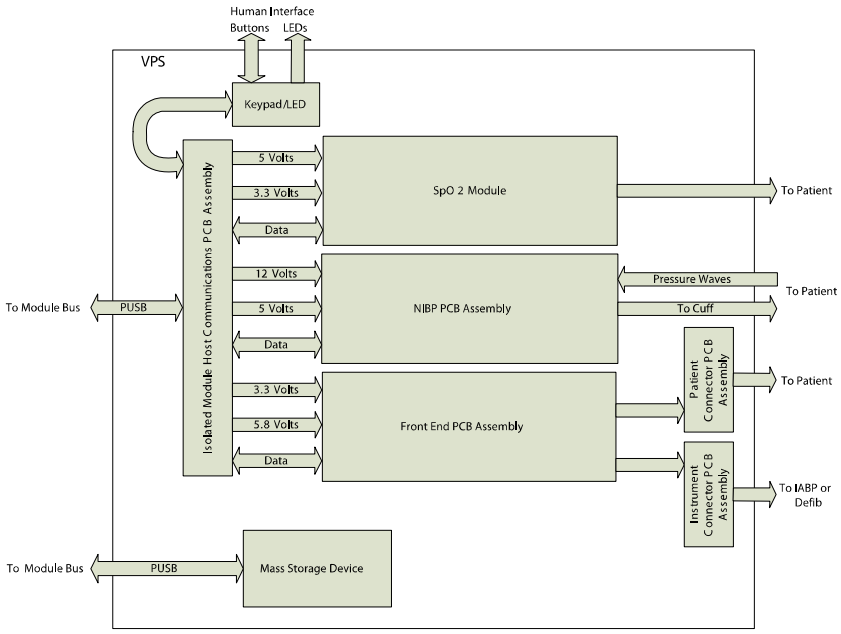


FIGURE 1-16 Electrical Architecture of VPS

The Front End serves as the main source of patient parameter data. It contains the primary functions of ECG, Respiration, IBP, and Temperature. FIGURE 1-17 shows the electrical architecture of front end module.

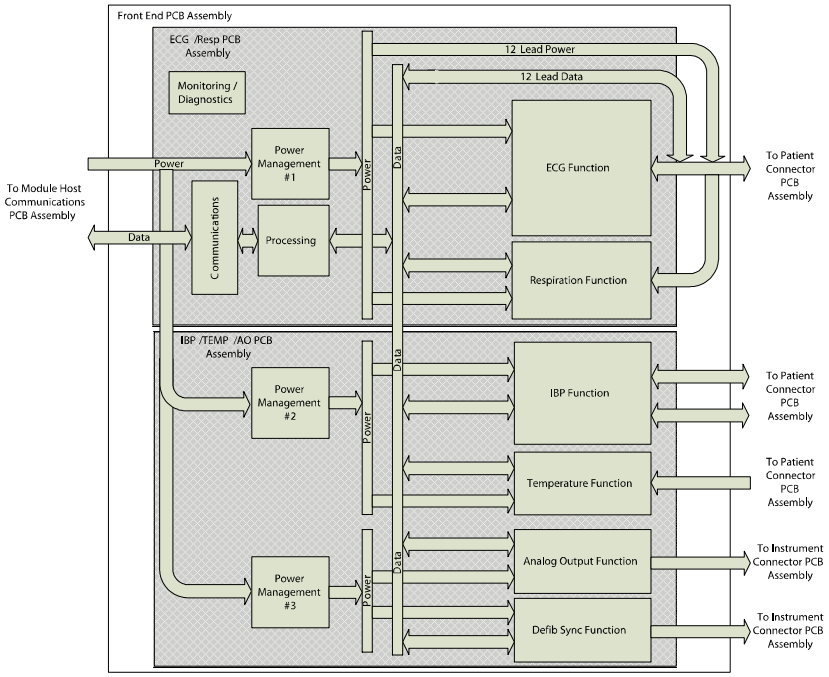


FIGURE 1-17 Electrical Architecture of Front End Module

Recorder Module

The Recorder module prints to an internal thermal recorder. FIGURE 1-18 shows the electrical architecture of recorder module.

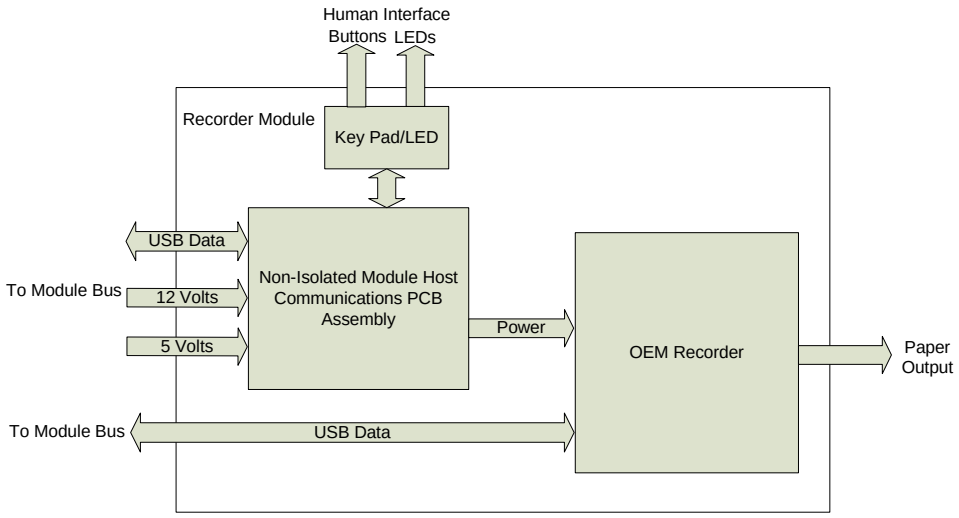


FIGURE 1-18 Electrical Architecture of Recorder Module

VDI Module

The VDI module acquires data from other medical devices supported by V series. It is a 1X module. FIGURE 1-19 shows the electrical architecture of VDI module.

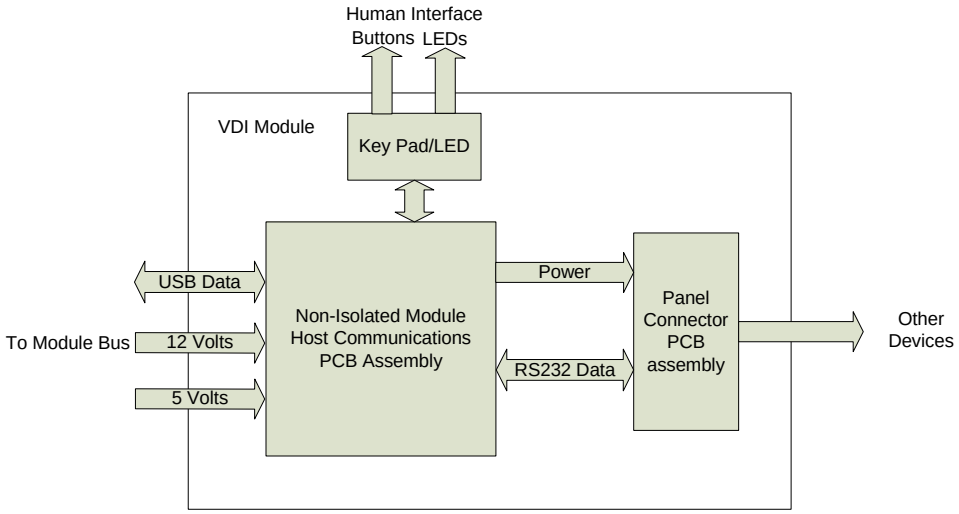


FIGURE 1-19 Electrical Architecture of VDI Module

CO_2 Module

The CO_2 module measures the percentage of CO_2 inspired and expired air from breathing. It is a 2X module. FIGURE 1-20 shows the electrical architecture of CO_2 module.

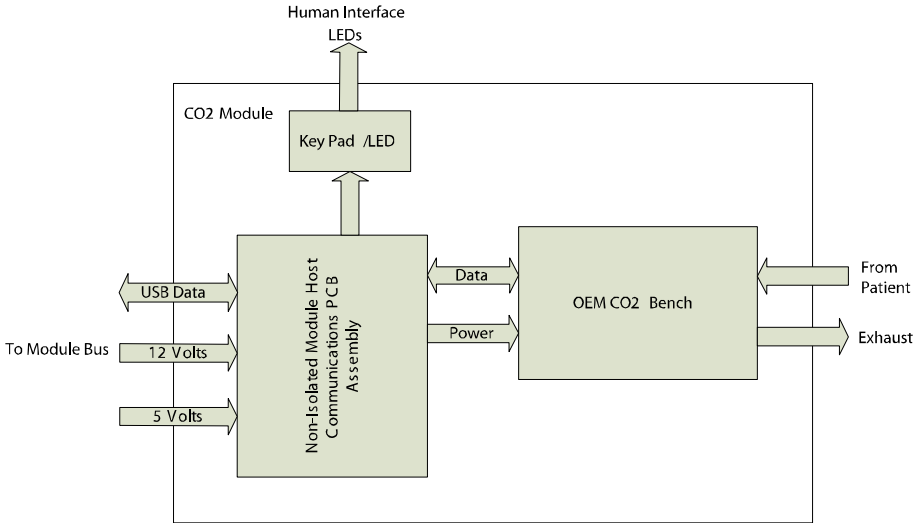


FIGURE 1-20 Electrical Architecture of CO_2 Module

C.O. Module

The cardiac output module measures thermodilution cardiac output. It is a 1X module. FIGURE 1-21 shows the electrical architecture of C.O. module.

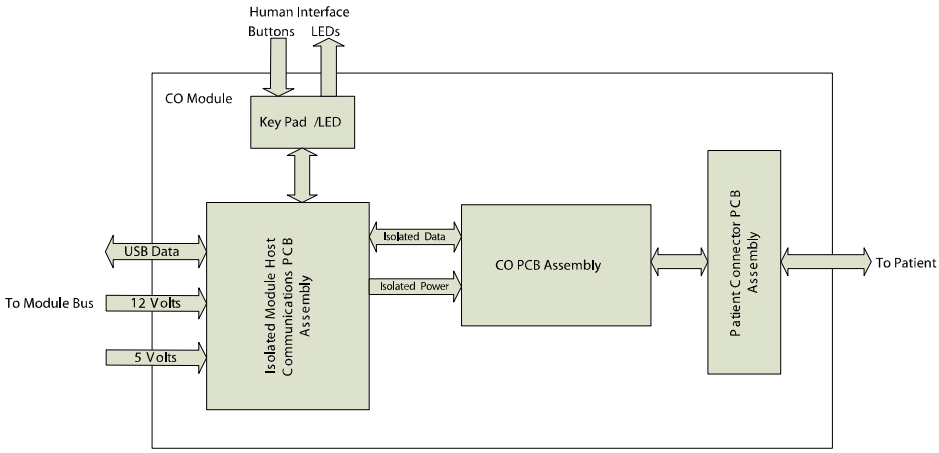


FIGURE 1-21 Electrical Architecture of C.O. Module

IBP Module

The IBP module measures the invasive blood pressure. It is a 1X module. FIGURE 1-22 shows the electrical architecture of IBP module.

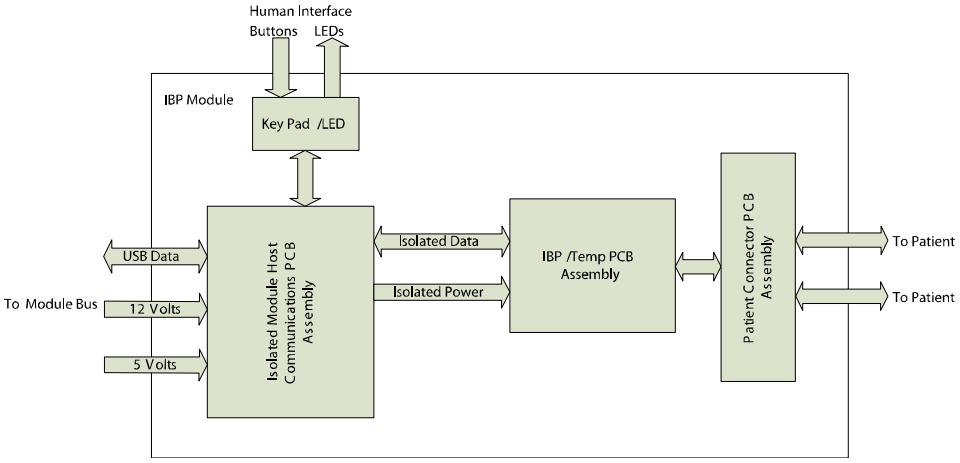


FIGURE 1-22 Electrical Architecture of IBP Module

TEMP Module

The Temp module measures temperature. It is a 1X module. FIGURE 1-23 shows the electrical architecture of TEMP module.

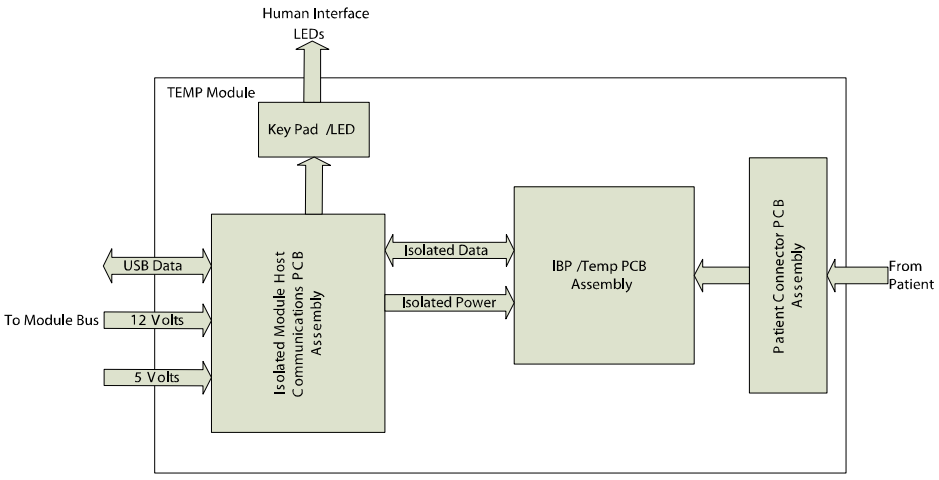


FIGURE 1-23 Electrical Architecture of TEMP Module

12L ECG/EKG Module

The12L ECG/EKG module monitors 12 lead ECG and Respiration including ST and arrhythmia analysis through the VPS module.

NIBP Module

The NIBP module measures non-invasive blood pressure. FIGURE 1-24 shows the electrical architecture of NIBP module.

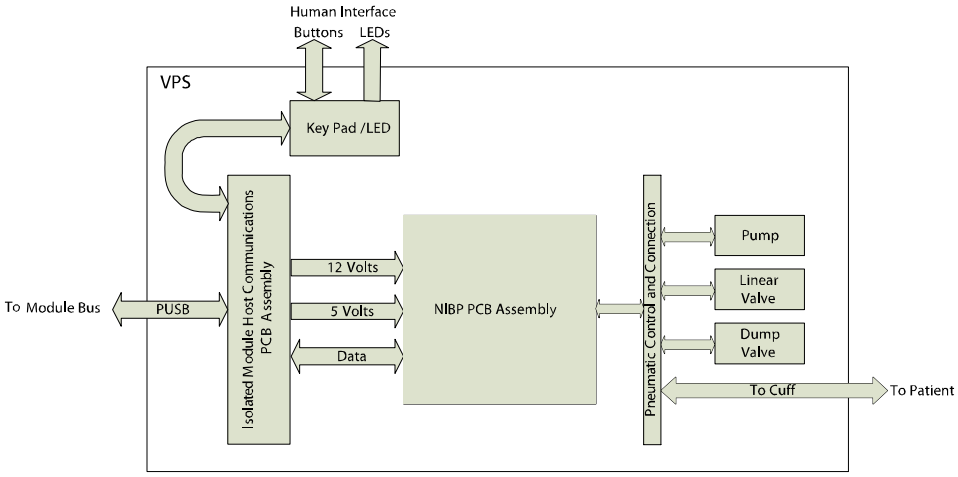


FIGURE 1-24 Electrical Architecture of NIBP Module

OEM SpO_2 Module

There are two types of SpO_2 modules: Masimo-2013 SpO_2 and Nellcor-1 SpO_2 module. Host communication board, keypad/LED and patient connector board are also needed to work with the OEM SpO_2 board. FIGURE 1-25 shows the electrical architecture of OEM SpO_2 module.

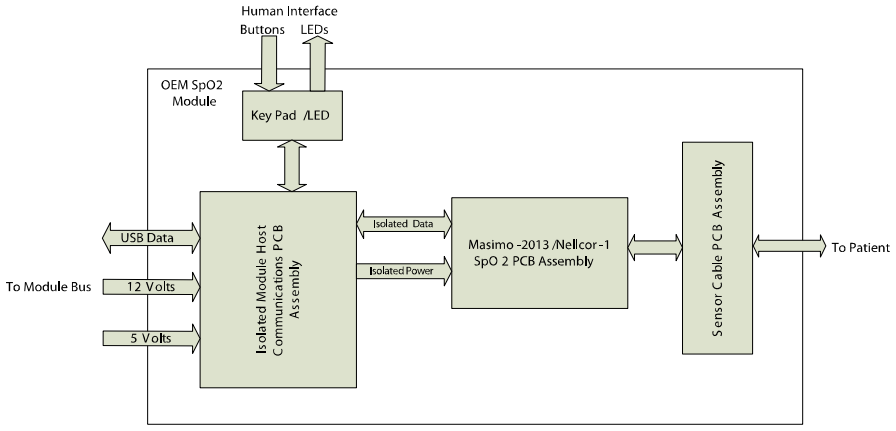


FIGURE 1-25 Electrical Architecture of OEM SpO_2 Module

2.0 Repair Information

2.1 Introduction

This chapter provides the necessary technical information to perform repairs on the instrument. The most important prerequisites for effective troubleshooting are a thorough understanding of the instrument functions as well as understanding the theory of operation.

2.2 Safety Precautions

In the event the instrument covers are removed, observe the following warnings and guidelines.

1. Do not short component leads together.
2. The instrument covers must not be removed by other than qualified technical personnel who have received supplementary instructions regarding maintenance of medical equipment or has equivalent experience in this area.

WARNING: Internal Electrical Shock Hazard -This unit does not contain any user-serviceable parts. Do not remove instrument covers. Refer servicing to qualified personnel.

WARNING: Whenever the monitor is opened for calibration or repair, a risk (leakage) current safety check and a verification of basic functions of all parameters should be performed before the monitor is returned clinical use. See "Verification" on page 5-21 for details.

2.3 Troubleshooting Guidelines

1. Identify the problem

Due to the wide variety of potential symptoms certain problems may be more subtle than others. One approach to troubleshooting is to set up the instrument as described in Chapter 5.0. Following the guidelines of the tests will help determine the problem if one exists.

2. Avoid shorting component leads

During repair procedures, it can become tempting to make a series of quick measurements. Always turn the power off before connecting and disconnecting the test Leads and probes. The accidental shorting of Leads can easily stress the components and cause a second failure (aside from the safety risk).

3. Use the proper equipment

The equipment listed below is suggested to fulfill a wide range of troubleshooting requirements. It is imperative to use the designated equipment in order to ensure proper results of any and all test procedures.

4. Clean up the repair area

After any repair, especially after any soldering or desoldering, clean off the repair area with alcohol and a stiff brush. This will remove any residual solder flux, in turn allowing the instrument to return to its original appearance.

2.4 Special Tools Required

- DVM
- Digital mercury manometer - 0 to 300 mmHg
- Safety analyzer
- Patient simulator
- NIBP test chamber / Dummy cuff (P/N 0138-00-0001-01 (700 cc) or -03 (500 cc))
- CAT-5 crossover cable
- USB cable 2.0
- USB memory stick or USB hard drive 2.0 specified in the Operator's Manual
- Desktop PC or notebook PC
  - Microsoft XP/Vista/Windows 7 operating system
  - Intel Pentium CPU, above 500MHz
  - Above 128M memory
  - At least one net card
  - At least one USB port

2.5 Disassembly Instructions

This section describes the disassembly procedures for the patient monitor and its components.

Tools Required

- Screwdrivers
- Flat-bladed screwdrivers
- Sharp nose pliers
- 3-mm inner hexagon wrench
- ESD mat and wrist strap
- Antistatic glove

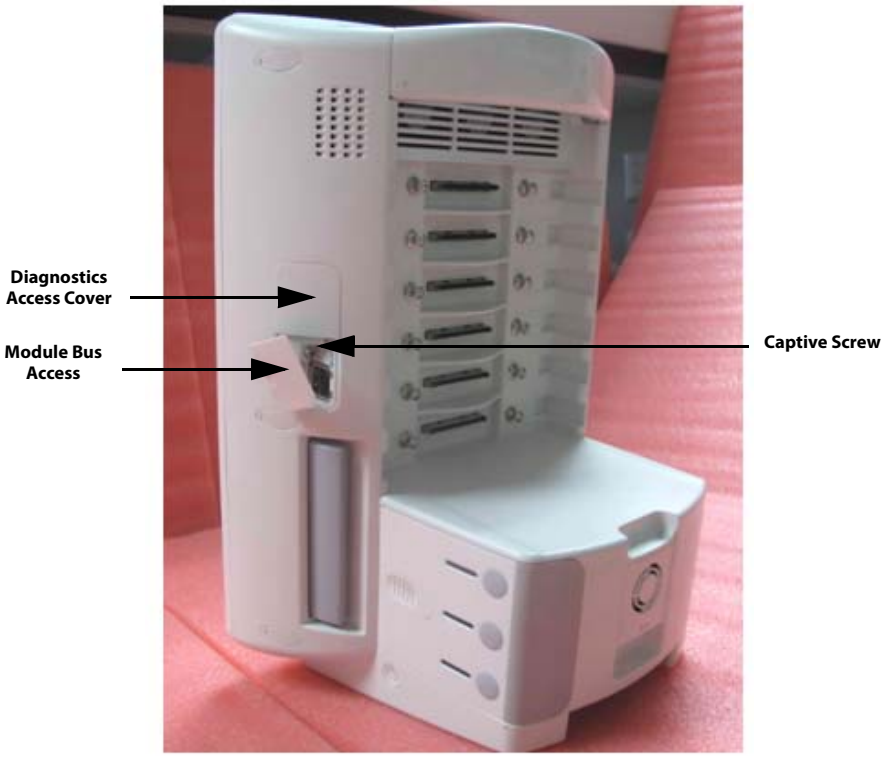
Preparation for Disassembly

1. Power down the **V 12/V 21**.
2. Remove the line cord from V Dock.
3. Remove all cable assemblies connecting to **V 12/V 21**, V Hub, and modules.
4. Remove all the modules from **V 12/V 21** and V Hub.
5. Remove any batteries installed.
6. Perform all work on a properly grounded ESD workstation.

2.5.1 Disassembling V 12 (12.1" Monitor)

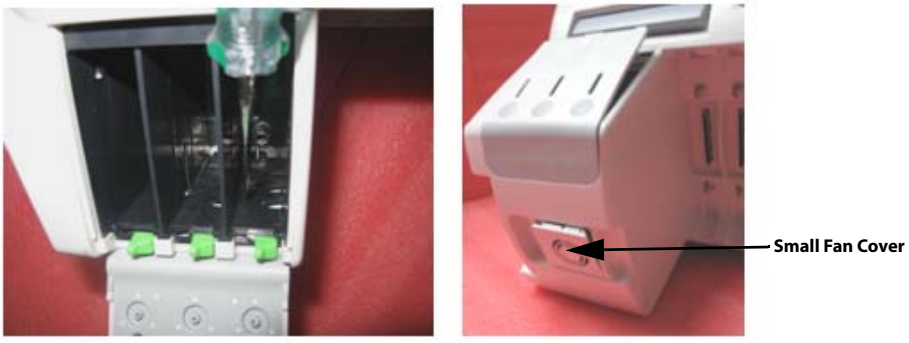
Removal of the Diagnostics Access Cover

1. Open the module bus access and loosen the captive screw.
2. Remove the diagnostics access cover.

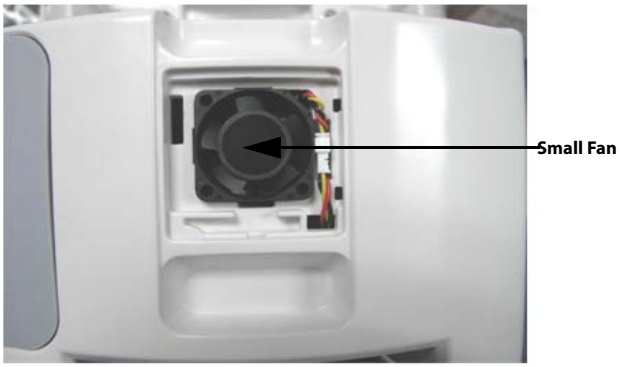


Removal of the Small Fan and Cable Assembly

1. Open the battery compartment door and use a flat-bladed screwdriver to push out the small fan cover from the hole of the first battery door.



2. Disconnect the small fan and cable assembly from the fan connecting cable.



NOTE: **When reassembling the small fan, ensure that the fan is installed in the proper direction.**

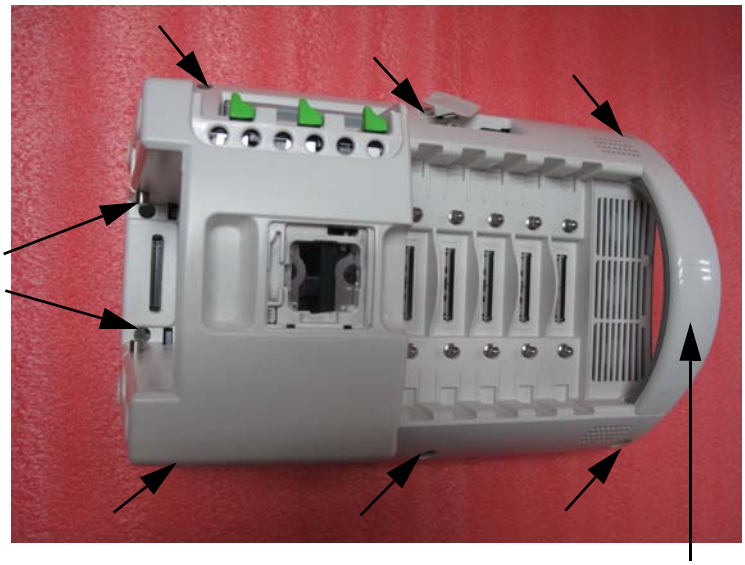
2.5.2 Removal of the Battery Door

Open the battery door and remove it.

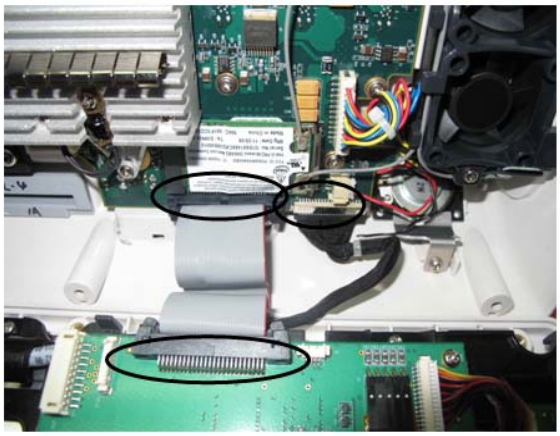
2.5.3 Removal of the Front Housing

1. Place the monitor face down on a protective surface.
2. Use a small flat-bladed screwdriver to remove the 6-screw-hole covers.

3. Remove the 6 M4X10 screws and loosen 2 captive screws from the rear of the monitor. Turn the rear housing over to the top side of the front housing as indicated by the long arrow shown in the first picture below.



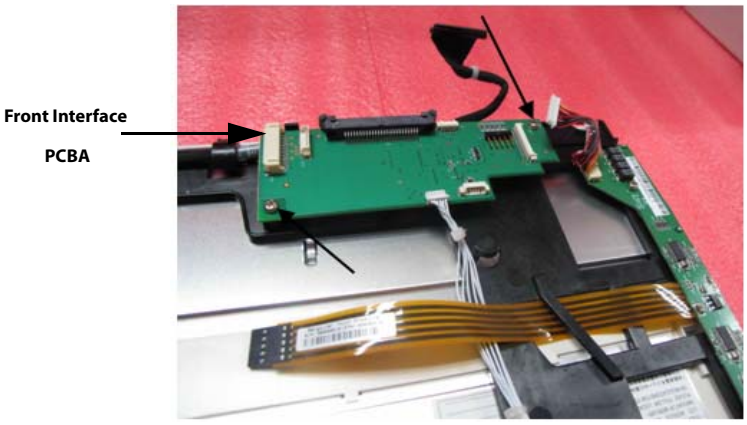
4. Remove the display cable from J13 of the carrier PCBA. Unlatch the sockets and remove the front interface cable from J14 of the carrier PCBA and JP2 of the front Interface PCBA.



Removal of the Alarm LED PCBA / CCFL Inverter PCBA /Front Interface PCBA

1. Remove the alarm LED cable from J1. Remove the CCFL inverter cable from JP6.

2. Remove the touchscreen cable from J4. Remove the 2 MX6 screws that secure the front interface PCBA.



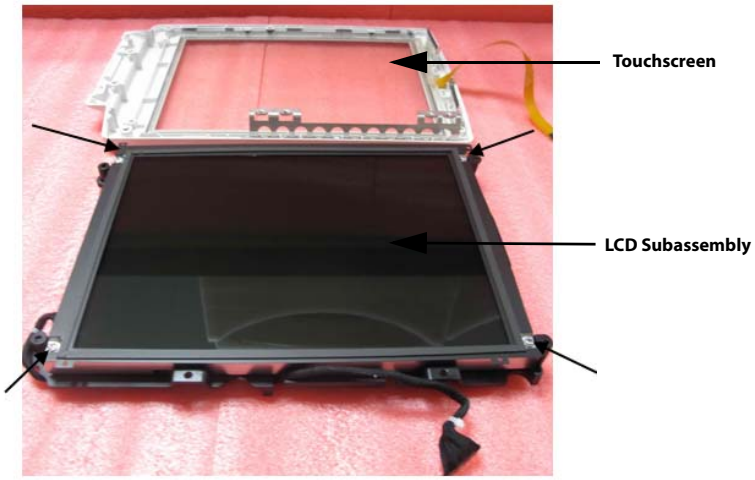
3. Remove the alarm LED cable from J1. Remove the 2 M3X6 screws that secure the alarm LED PCBA.

4. Remove the LCD cable from CN2. Remove the CCFL inverter cable from CN1. Remove the 2 M3X6 screws that secure the CCFL inverter.

Removal of the LCD/Display Cable /Touchscreen

1. Remove the 8 M3X6 screws. First pull the LCD subassembly out from the bracket. Then lift the subassembly up and place the LCD face up.

2. Remove the display cable from the LCD. Remove the 4 M3X6 screws and separate the LCD from the display mounting frame. Remove the touchscreen from the front housing.

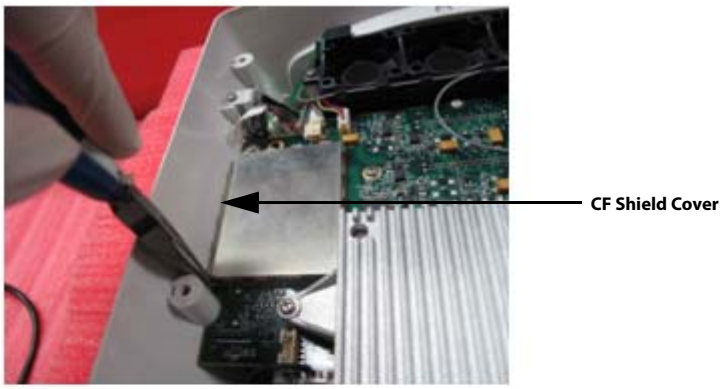


2.5.4 Removal of the Back Housing

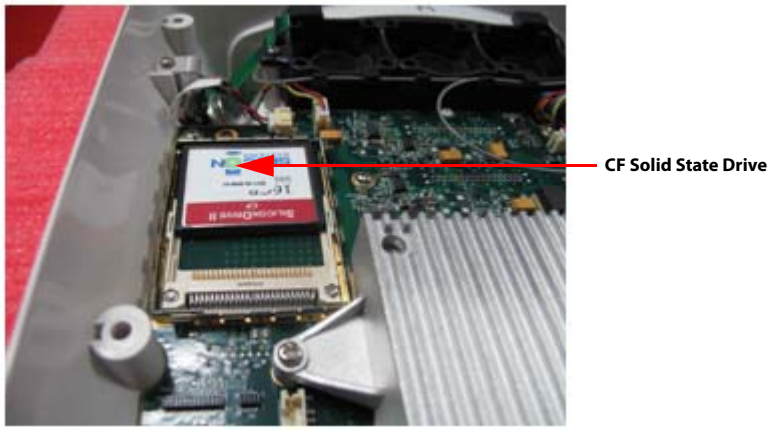
Lie down the back housing and use an underlay to secure it.

Removal of the CF Solid State Drive

1. Open the CF Shield cover with sharp nose pliers clamping the tips of the cover.



2. Remove the CF solid state drive from the carrier PCBA by pushing it up forward.



Removal of the Wireless Transceiver/Antenna and Cable Assembly

1. Remove the 2 antenna and cables from the wireless transceiver.
2. Remove the 2 M3X6 screws that secure the fan mounting bracket. Then pull out the antenna and cables.

3. Unfold the clips (two places) and remove the wireless transceiver.

Removal of the Triple Fans and Cable Assembly

Remove the cable from the carrier PCBA J30. Remove the fans and gasket from the back housing. Then remove the fans from the gasket.

NOTE: **When reassembling the fans, make the side of the fans with marks (the figure on the left) face the symmetric holes of gaskets and the other side (the figure on the right) face the dissymmetric holes. Ensure that the side with marks face outside when assembling the fan to the back housing.**

Face outside

Face inside

Removal of the Speaker and Cable Assembly

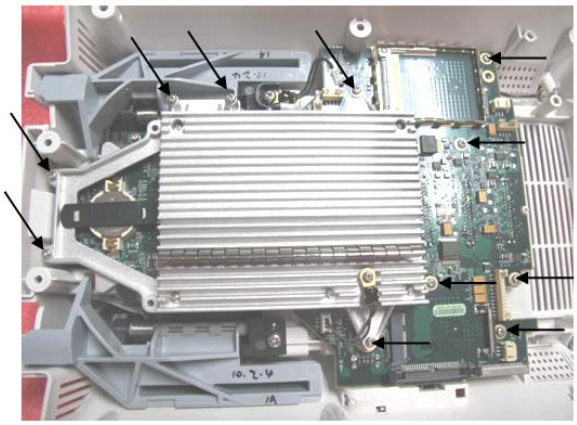
Remove the speaker cable assembly from J9 and J12 of the carrier PCBA. Remove the 2 M3X6 screws and 2 speaker mounting brackets.

Removal of the Handle

Remove the 2 M3X16 socket-head screws with 3-mm inner hexagon wrench. Separate the handle from the back housing.

Removal of the Carrier Board and CPU Subassembly

1. Remove the thermistor and cable assembly from J20 of the carrier board PCBA. Remove the 5 M3X6 pan head screws that secure the carrier PCBA. Remove the 6 M3X12 screws that secure the heat-sink.

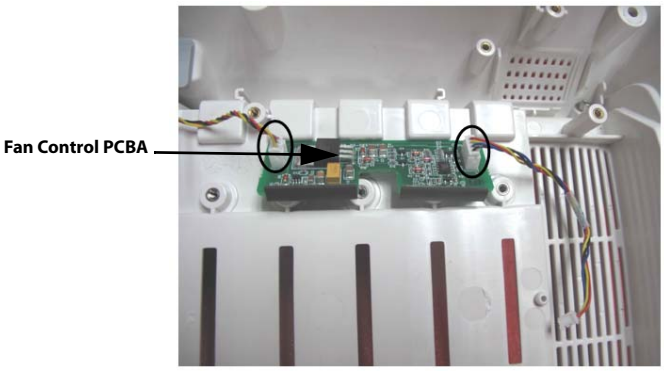


2. Hold the back of the heat-sink and pull the assembly out carefully.

NOTE: **EMI clip is assembled at the sixth rib on the heat-sink for V 12 only.**

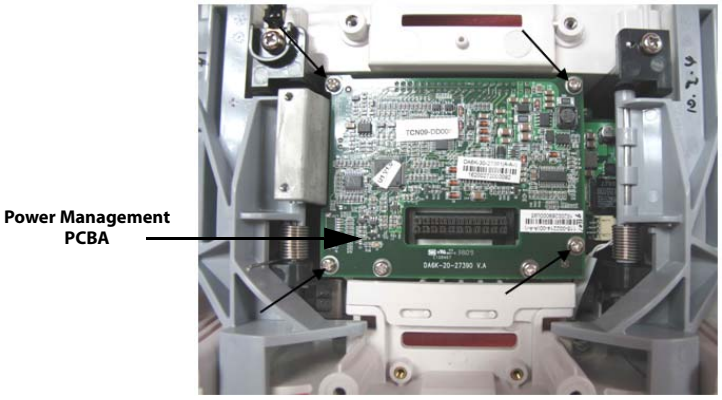
Removal of the Fan Control PCBA

Remove the fan control PCBA from the back housing assembly. Remove the carrier board connecting cable from J1. Remove the fan connecting cable from J2.

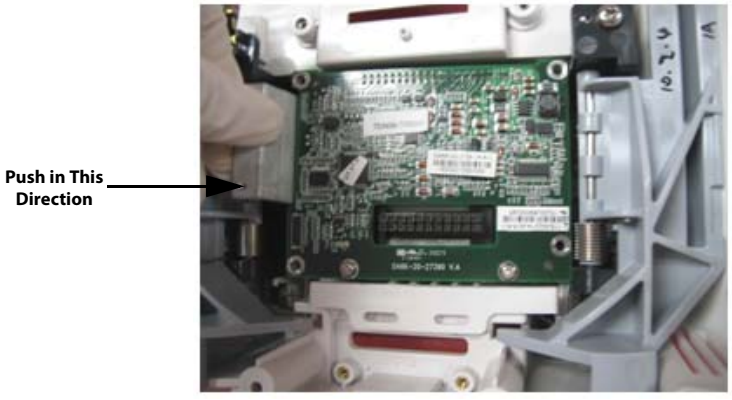


Removal of the Power Management PCBA

1. Remove the 4 M3X30 screws that secure the power management PCBA.



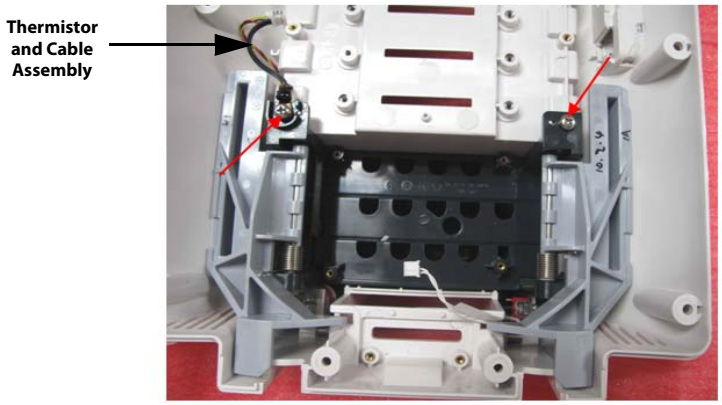
2. Separate the power management PCBA from the back housing assembly by pushing its heat-sink to the right.



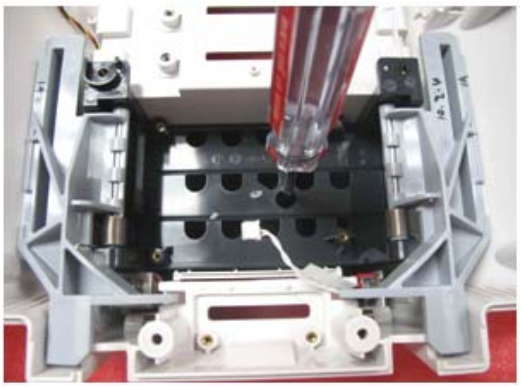
3. Slant the power management module toward 1 marked in the figure below and remove it.
4. Remove the pushbutton switch and cable from J3.

Removal of the Chassis Subassembly

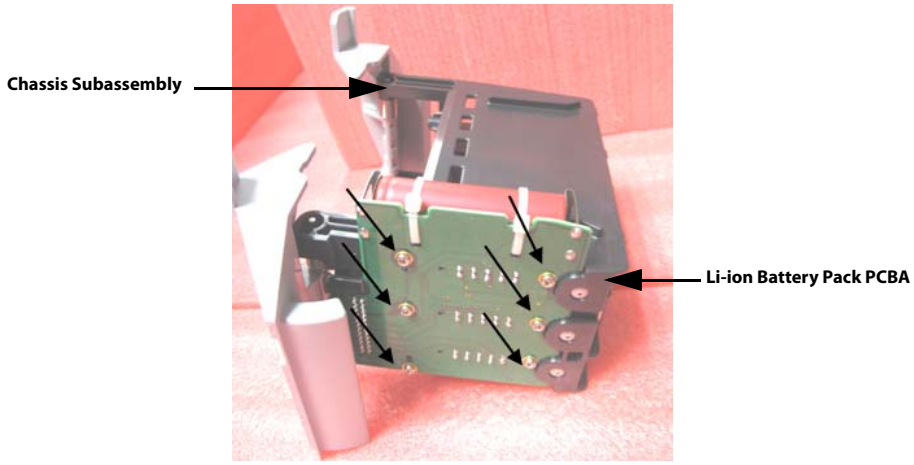
1. Remove the 2 M4X10 screws and the thermistor and cable assembly.



2. Remove the captive screw in the bottom of the chassis and pull out the chassis assembly.

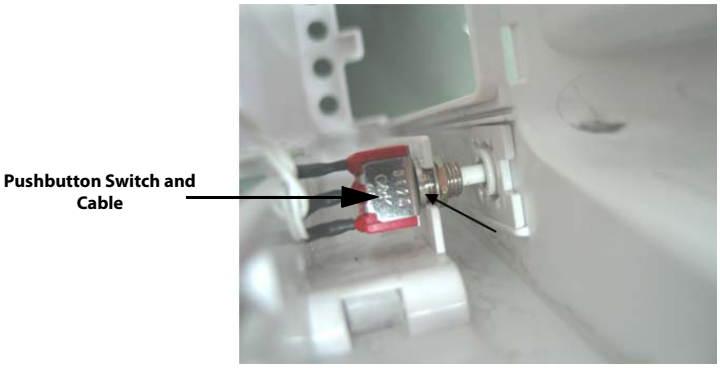


3. Remove the 6 M3X6 screws to separate the li-ion battery pack PCBA.

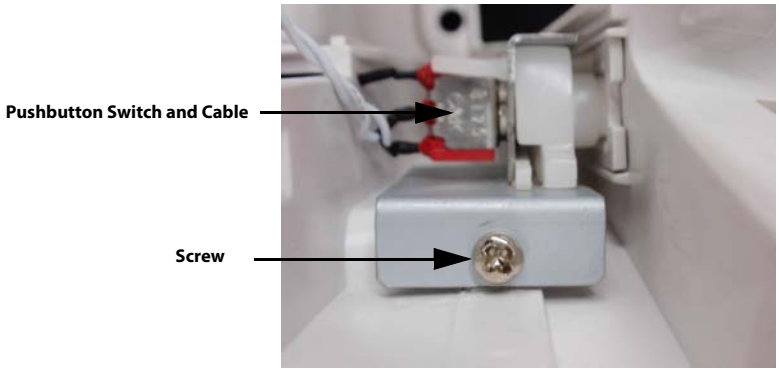


Removal of the Pushbutton Switch and Cable Assembly

If the pushbutton switch and cable assembly in your unit is the one as shown below, loosen the nut with sharp nose pliers and pull out the pushbutton switch and cable assembly carefully.



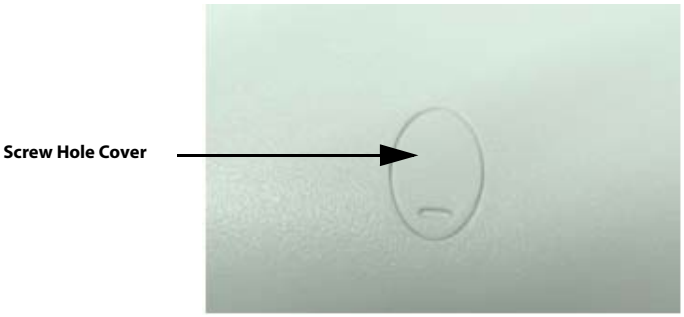
If the pushbutton switch and cable assembly in your unit is the one as shown below, loosen the screw and remove the pushbutton switch and cable assembly.



2.5.5 Disassembling V 21 (21.3" Monitor)

Removal of the Front Housing

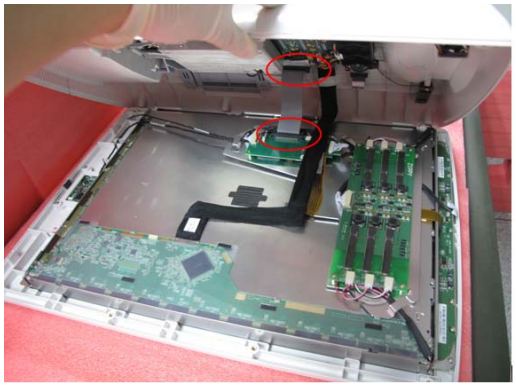
1. Place the monitor face down on a protective surface.
2. Use a small flat-bladed screwdriver to remove the 8 screw hole covers.



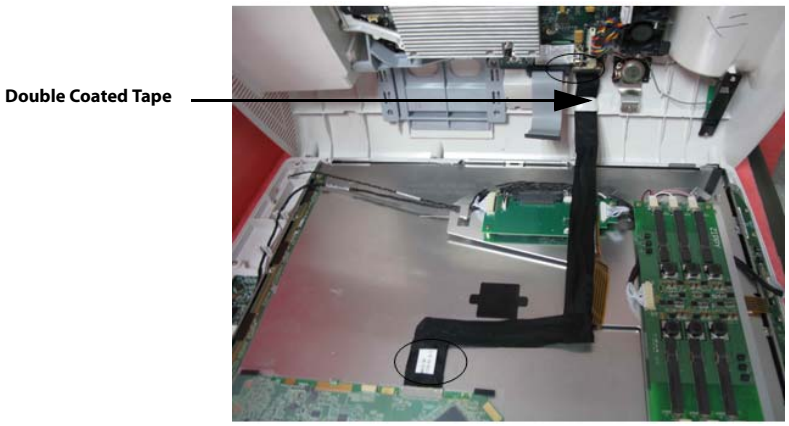
3. Remove the 8 M4X10 screws from the rear of the monitor. Turn the rear housing over to the left side of the front housing.

CAUTION: Do not tilt the rear housing for more than 45 degrees to prevent any possible damage to the front interface cable inside the monitor.

Unlatch the sockets and remove the front interface cable from J14 of the carrier PCBA and JP2 of the front interface PCBA.

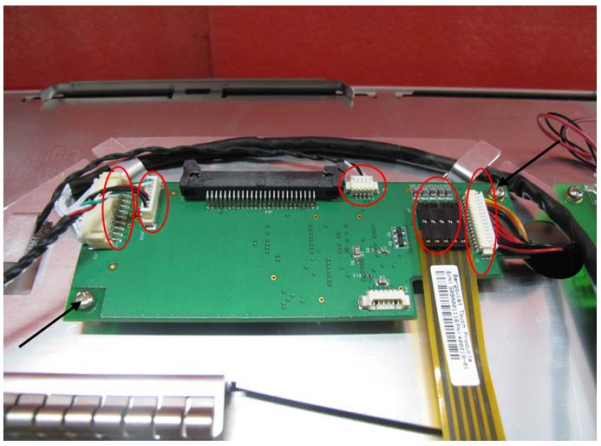


4. Remove the double-coated tape that secures the display cable. Remove the display cable from J13 and J24 of the carrier PCBA. Remove the display cable from the socket of the LCD.



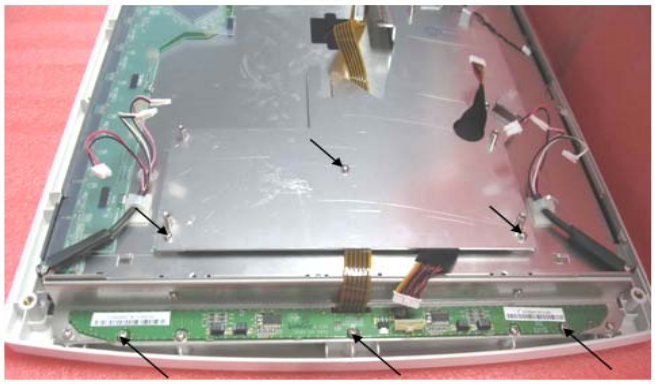
Removal of the Front Interface PCBA / CCFL Inverter PCBA / Alarm LED PCBA / Front Plate/ Touchpad

1. Remove the alarm LED cable from J1.
2. Remove the touchpad cable from Jp10.
3. Remove the AC present cable from J3.
4. Remove the touchscreen cable from J4.
5. Remove the CCFL inverter cable from JP5.
6. Remove the 2 M3X6 screws that secure the front interface PCBA.

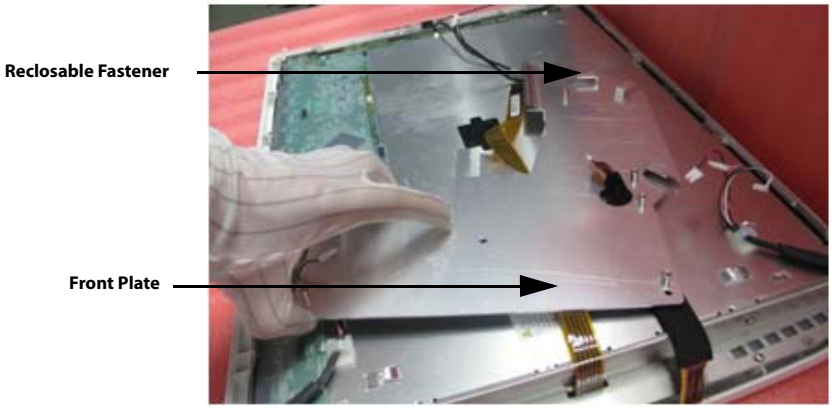


7. Remove the LCD cable from the CCFL inverter PCBA (6 places).
8. Remove the CCFL inverter cable from CN. Remove the 4 M3X6 screws that secure the CCFL inverter PCBA.

9. Remove the alarm LED cable from J1. Remove the 3 M3X6 screws that secure the alarm LED PCBA.



10. Remove the 3 M3X6 screws that secure the front plate (shown in the picture above) and turn the front plate around to separate the reclosable fastener.



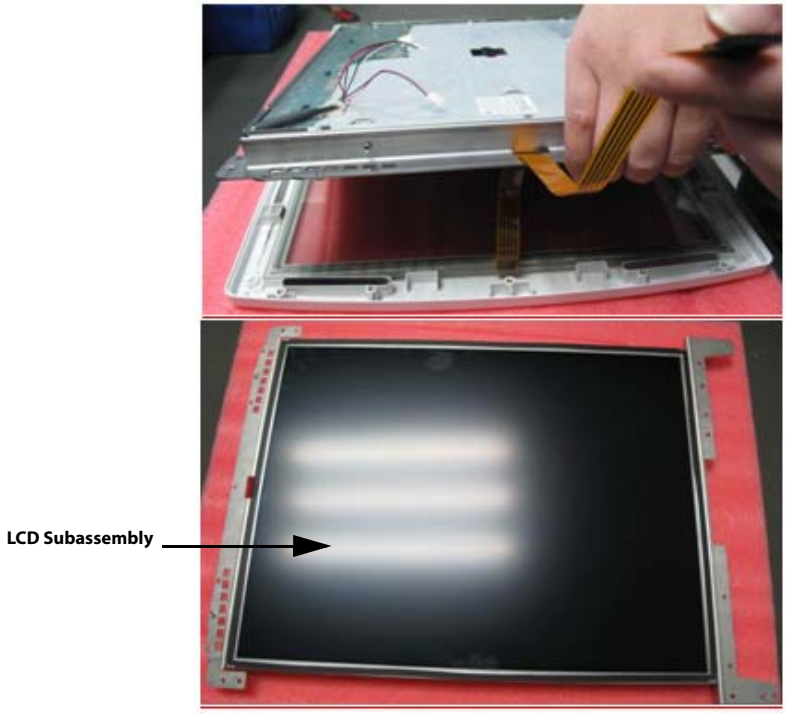
NOTE: One EMI clip is assembled on the front plate.

11. Remove the 4 M3X6 screws that secure the touchpad mounting frame.

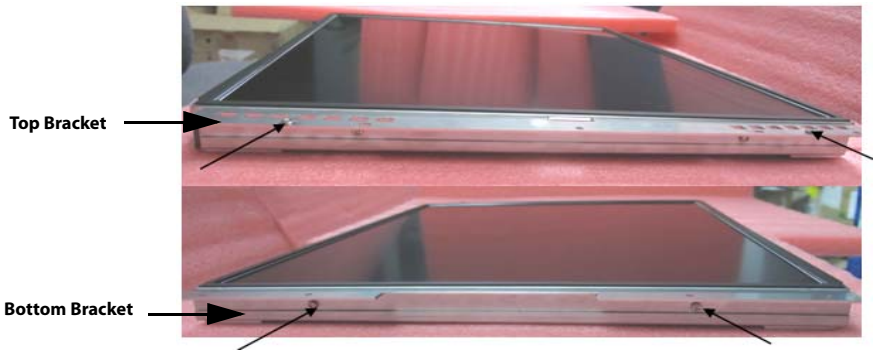
12. Remove the touchpad mounting frame.

Removal of the LCD/Touchscreen

1. Remove the 14 M3X6 screws that secure the LCD subassembly.
2. Lift the subassembly up and pull out the touchscreen cable carefully and place the LCD face up. Separate the touchscreen from the front housing.



3. Remove the 2 M3X6 screws that secure the top bracket to the LCD.
4. Remove the 2 M3X6 screws that secure the bottom bracket to the LCD.

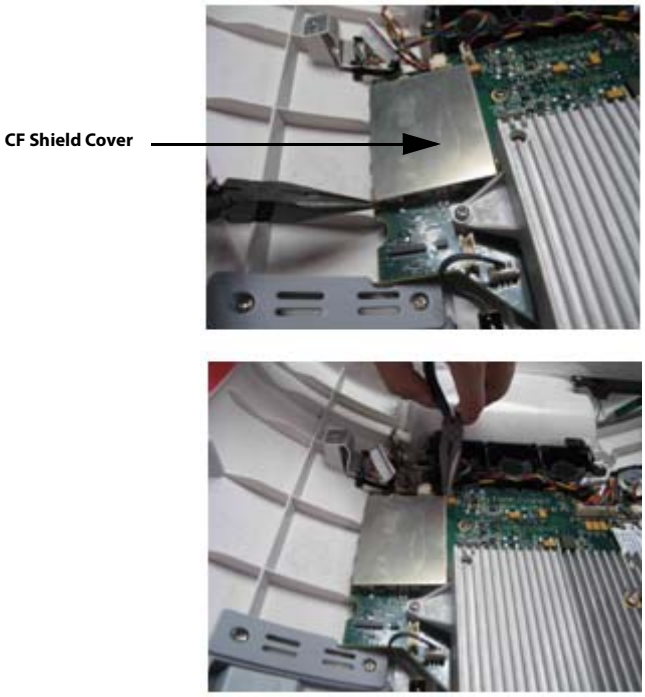


Removal of the Back Housing

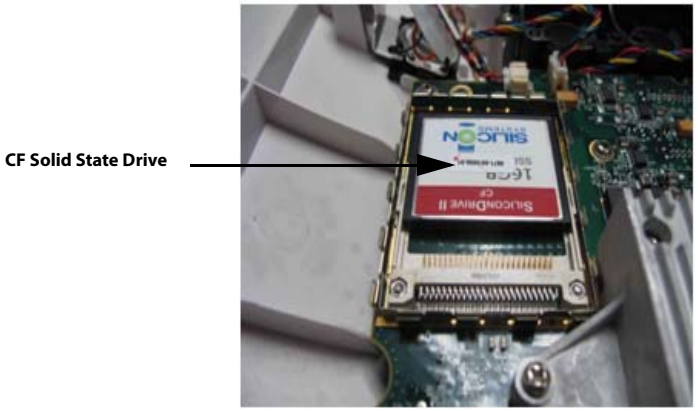
Lie down the back housing and use an underlay to secure it.

Removal of the CF Solid State Drive

1. Open the CF shield cover using sharp nose pliers to clamp the tips of the cover.

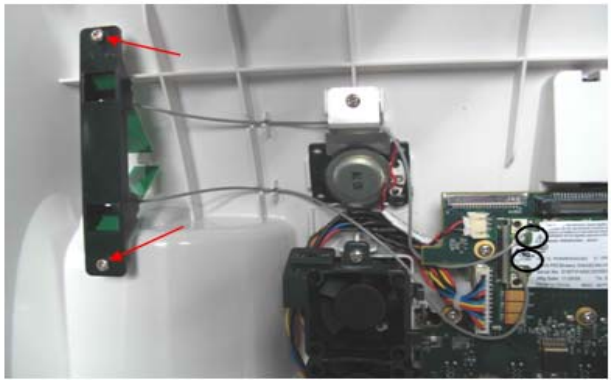


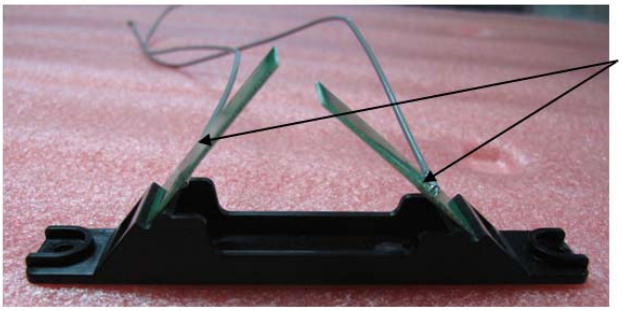
2. Remove the CF solid state drive from the carrier PCBA by pushing it up forward.



Removal of the Wireless Transceiver/Antenna and Cable Assembly

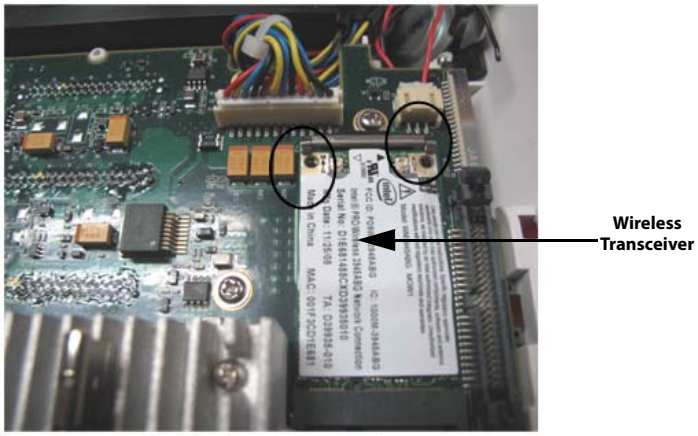
1. Remove the two antenna and cables from the wireless transceiver. Remove the 2 M3X6 screws that secure antenna mounting bracket. Then pull out the antenna and cables.





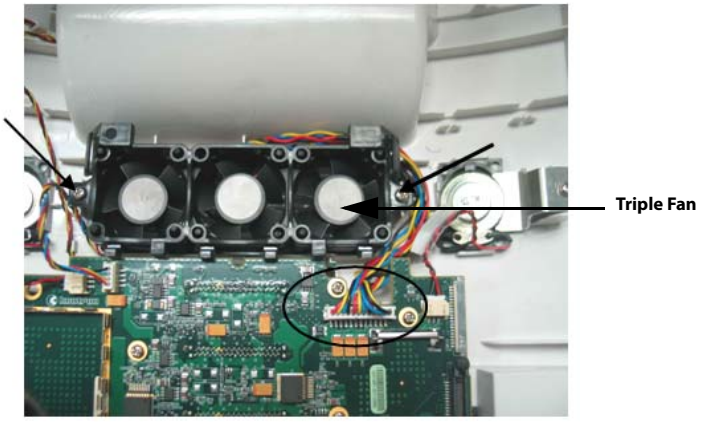
NOTE: **After reinstallation, the assembled antenna and cable assembly should look the same as the one above.**

2. Unfold the clips (2 places) and take out the wireless transceiver.



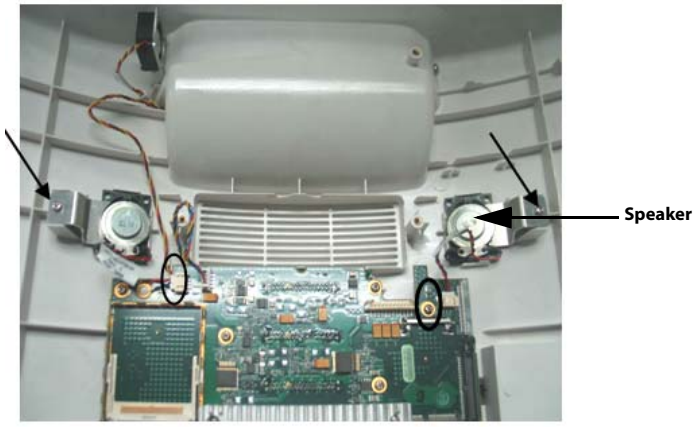
Removal of the Triple Fan and Cable Assembly

Remove the cable from the carrier PCBA J30. Remove the 2 screws that secure the fan mounting bracket. Pull off the 12 fan mounting fasteners.



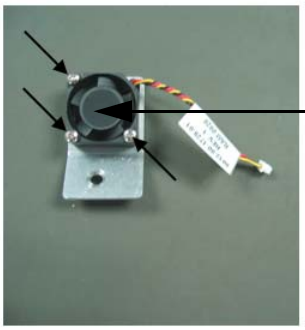
Removal of the Speaker and Cable Assembly

Remove the speaker cable assembly from J9 and J12 of the carrier PCBA. Remove the 2 M3X6 screws and the 2 speaker mounting brackets.



Removal of the Small Fan/Handle

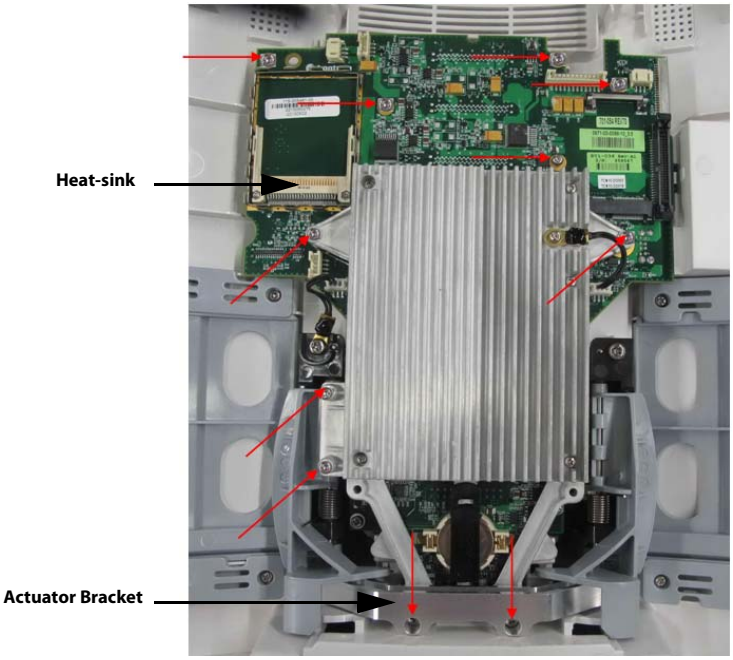
1. Remove the small fan cable from the socket of the fan control cable. Remove the M4x12 screws. Remove the 3 M2.5x12 screws.



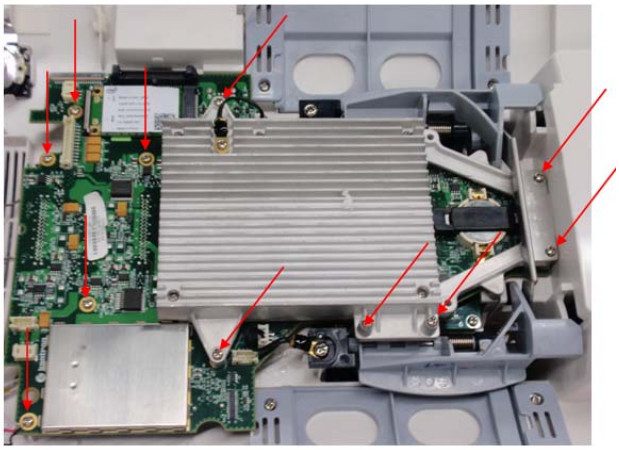
2. Remove the other M4x12 screws and separate the handle from the back housing.

Removal of the Carrier Board and CPU Subassembly

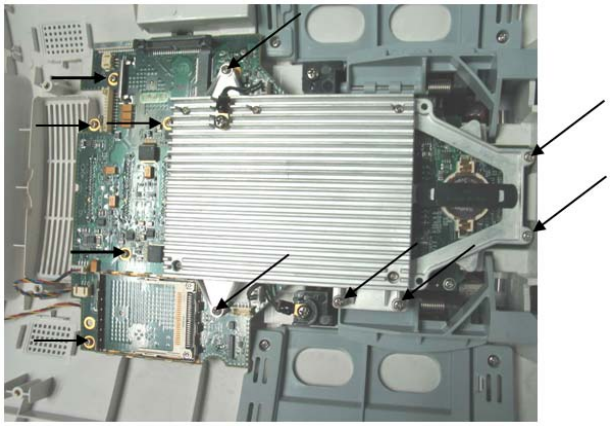
1. Remove the thermistor and cable assembly from J20 of the carrier board PCBA. If the carrier board and CPU subassembly is the one as shown below, first remove the 2 M3X20 screws that secure the actuator bracket, then remove the 4 M3X16 screws that secure the heat-sink, and then remove the 5 M3X6 screws that secure the carrier PCBA.



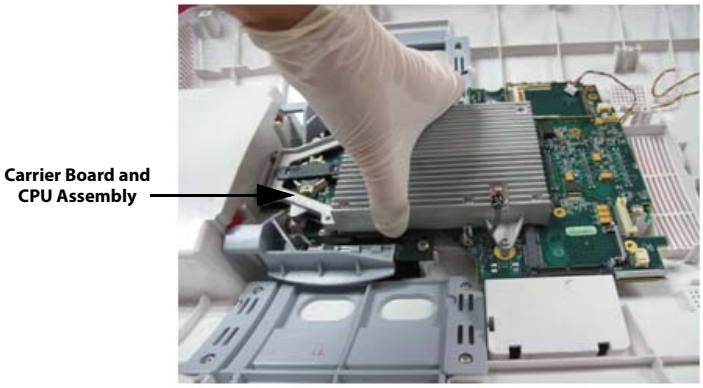
If the carrier board and CPU subassembly is the one as shown below, first remove the 6 M3X18 screws that secure the actuator bracket and the heat-sink and then remove the 5 M3X6 screws that secure the carrier PCBA.



2. Remove the 5 M3X6 screws that secure the carrier PCBA. Remove the 4 M3X12 screws that secure the heat-sink.

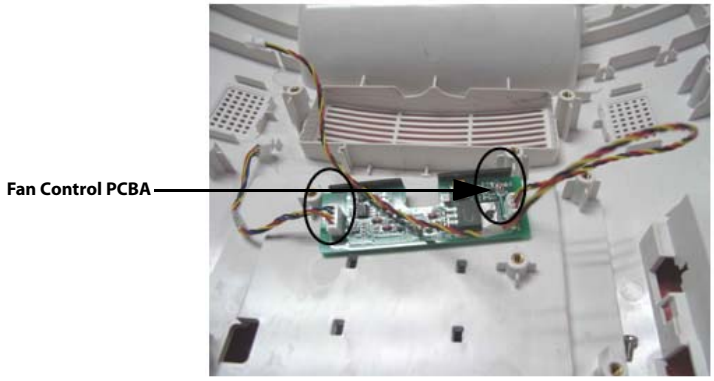


3. Hold the back of the heat-sink and pull the subassembly out.



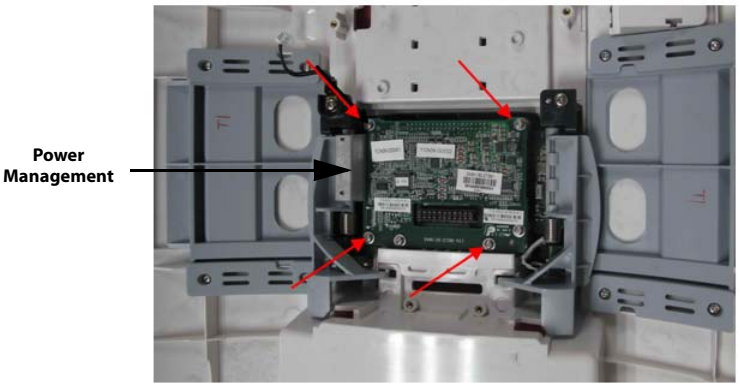
Removal of the Fan Control PCBA

Remove the fan control PCBA from the back housing assembly. Remove the carrier board connecting cable from J1. Remove the fan connecting cable from J2.

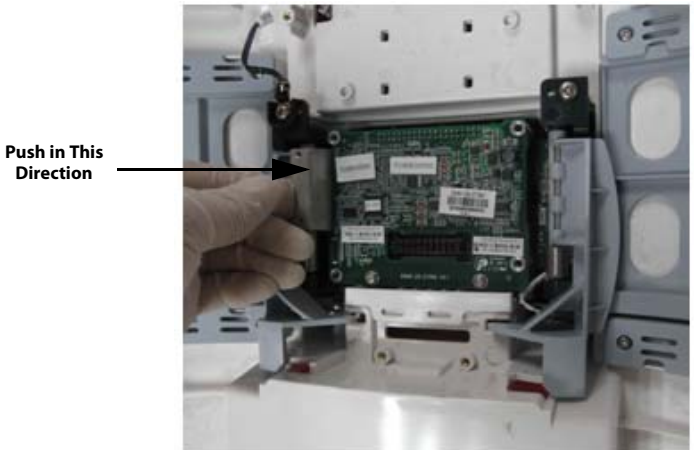


Removal of the Power Management PCBA

1. Remove the 4 M3X30 screws that secure the power management PCBA.



2. Separate the power management PCBA from the back housing assembly by pulling its heat-sink to the right.

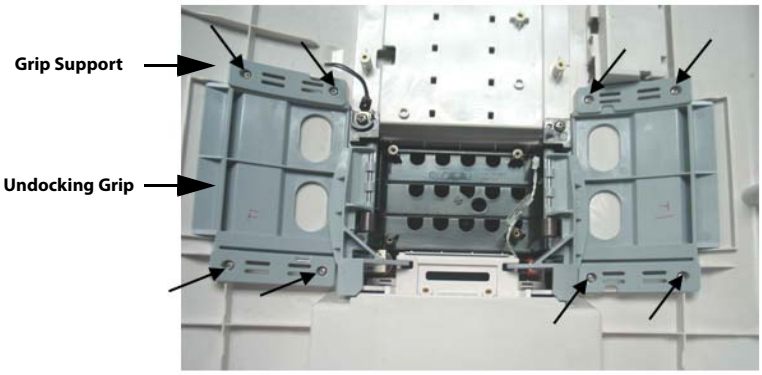


3. Slant the power management module toward 1 marked in the figure below and remove it.

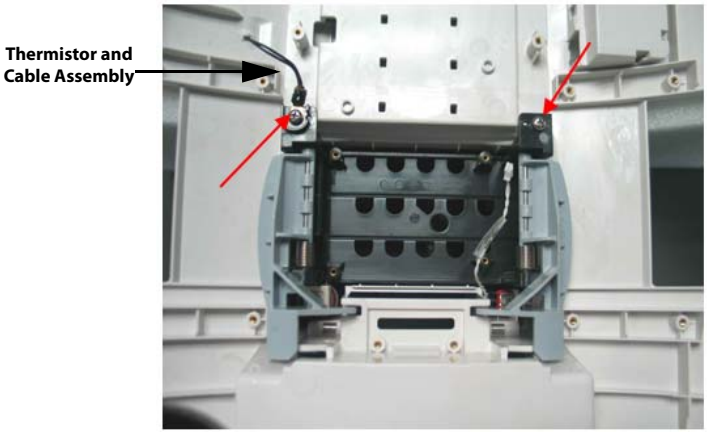
4. Remove the pushbutton switch and cable from J3.

Removal of the Monitor Undocking Grips/ Chassis Subassembly

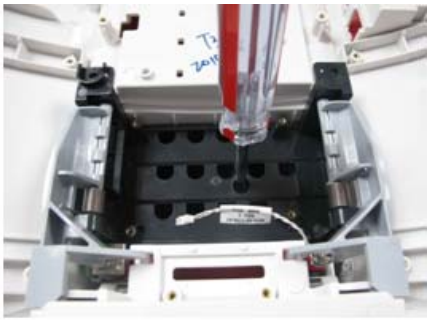
1. Remove the 8 M3X6 screws and 4 grip supports. Remove the undocking grips.

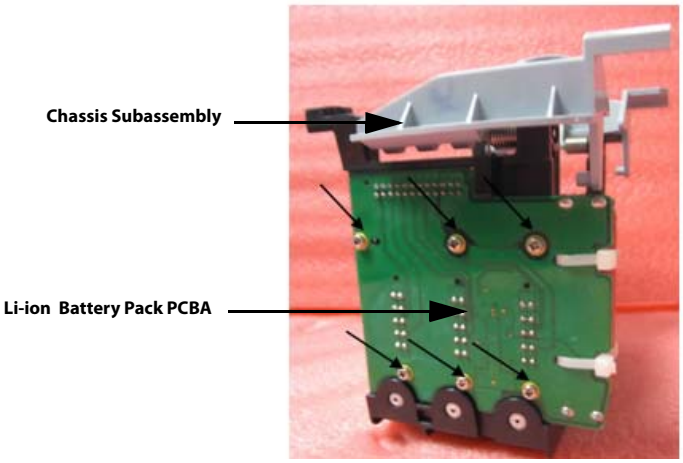


2. Remove the 2 M4X10 screws and the thermistor and cable assembly.



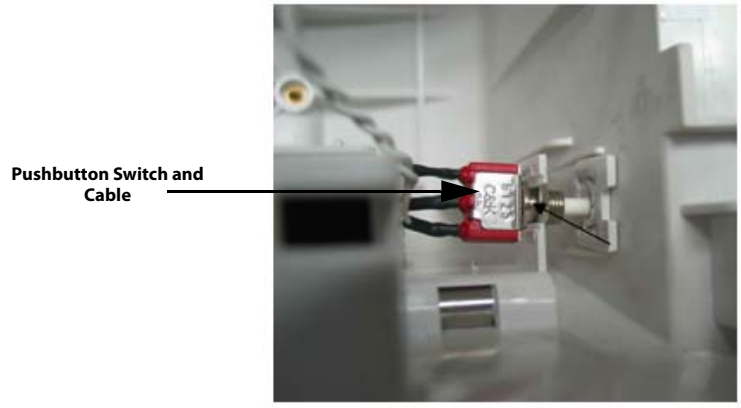
3. Remove the captive screw in the bottom of the chassis and pull out the chassis.
4. Remove the 6 M3X6 screws to separate the li-ion battery pack PCBA.



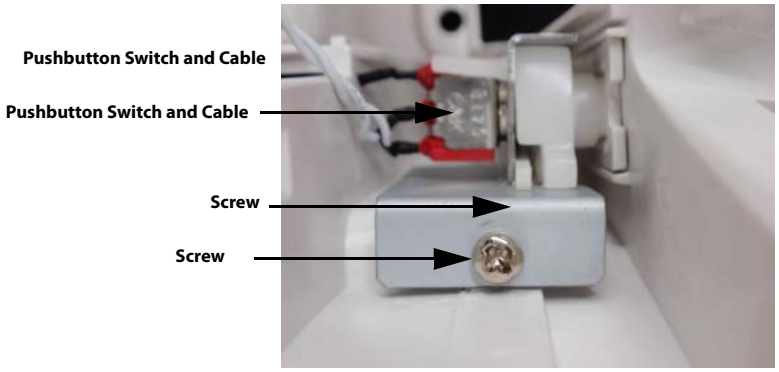


Removal of the Pushbutton Switch and Cable Assembly

If the pushbutton switch and cable assembly in your unit is the one as shown below, loosen the nut with sharp nose pliers and pull out the pushbutton switch and cable assembly carefully.

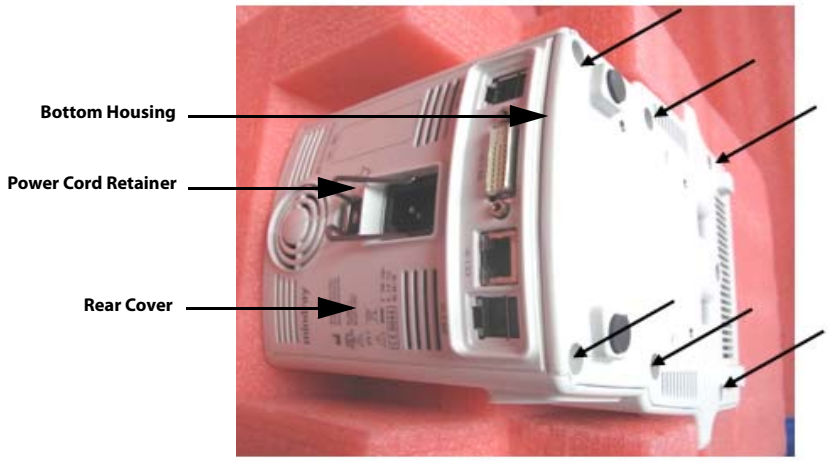


If the pushbutton switch and cable assembly in your unit is the one as shown below, loosen the screw and remove the pushbutton switch and cable assembly.



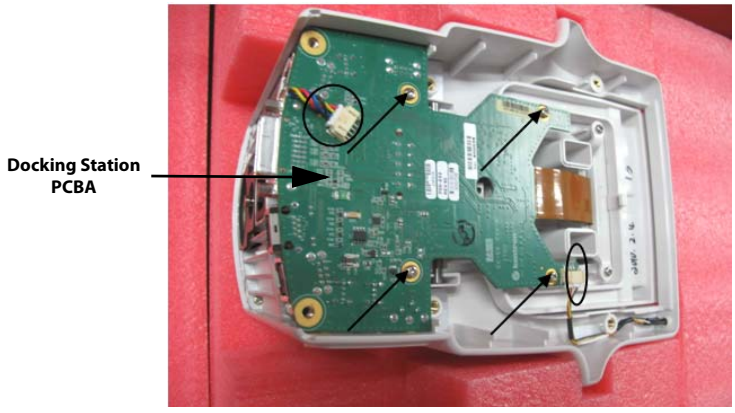
2.5.6 Disassembling V Dock

1. Place the V Dock (docking station) top-down and use an underlay to secure it.
2. Remove the 6 M4X10 screws.
3. Remove the bottom housing.
4. Remove the power cord retainer.
5. Open the rear cover.

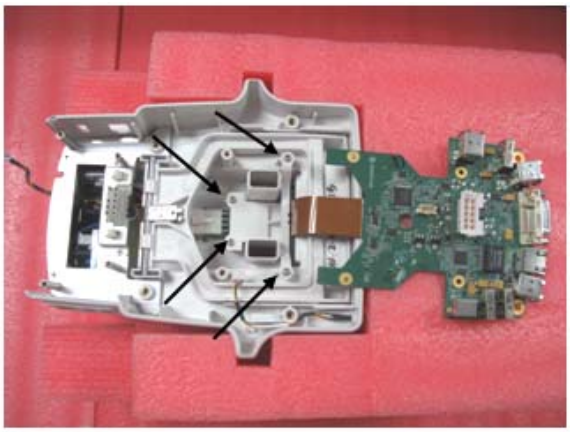


Removal of the Docking Station PCBA/Power Pin Board

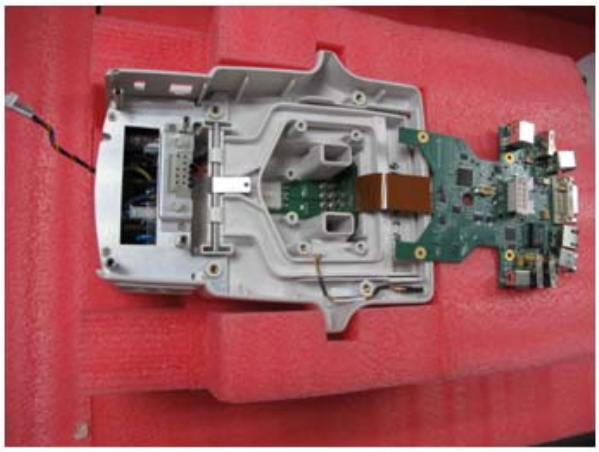
1. Remove the AC/charge indicator cable from J14.
2. Remove the fan cable assembly from J16.
3. Remove the 4 M3X6 screws that secure the docking station PCBA.



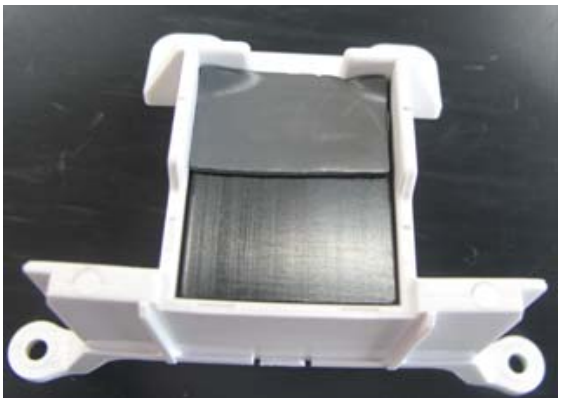
4. Turn the docking station PCBA over to the other side.



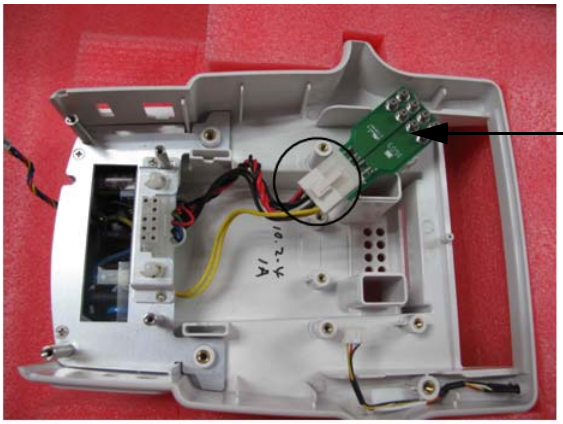
5. Remove the 4 screws that secure the support bracket (as shown in the picture above). Then separate the support bracket and the docking station PCBA.



NOTE: **The support bracket includes a heat-sink and silica gel as shown below.**

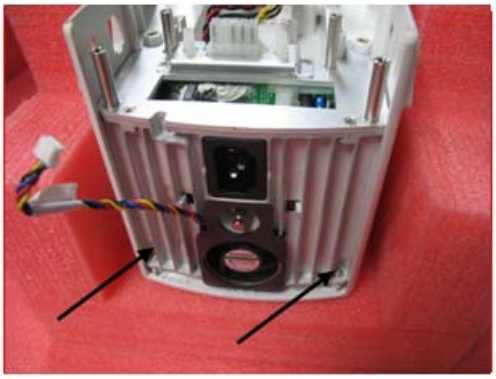


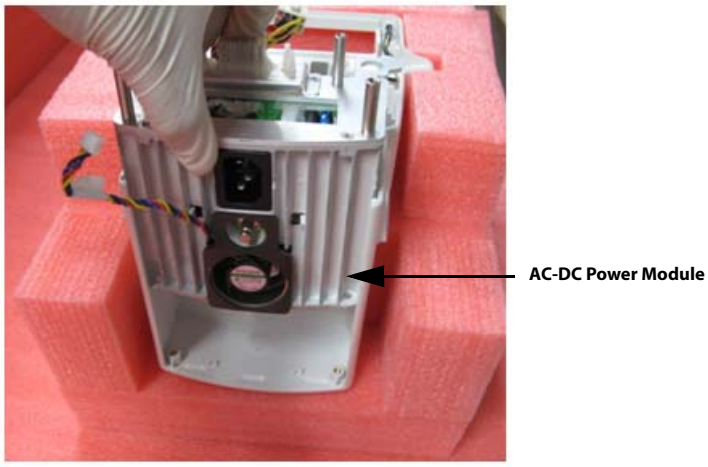
6. Remove the power pin board.
7. Remove the cable of AC-DC power module from J1 of the power pin board.



Removal of the AC-DC Power Module

1. Remove the 2 M3X6 screws.
2. Pull the AC-DC power module out of the top housing.



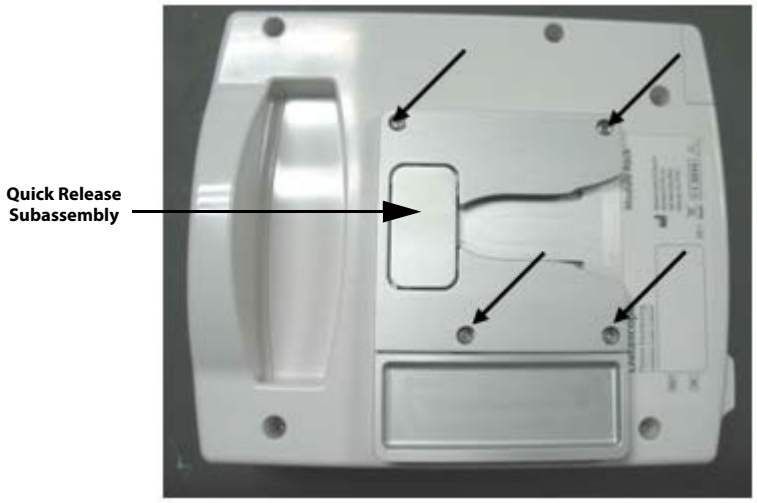


2.5.7 Disassembling V Hub

Place the V Hub face down on a protective surface.

Removal of the Quick Release Subassembly

Remove the 4 M3X6 screws that secure the quick release subassembly.

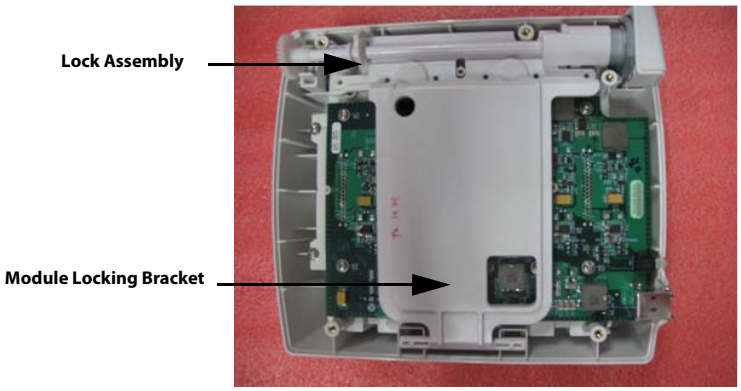


Removal of the Back Housing

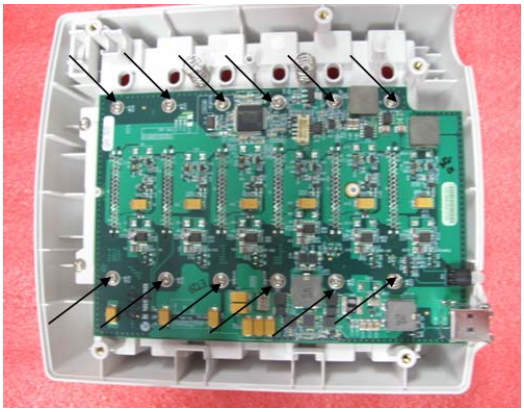
Remove the 5 M3X6 screws and open the back housing.

Removal of the V Hub PCBA

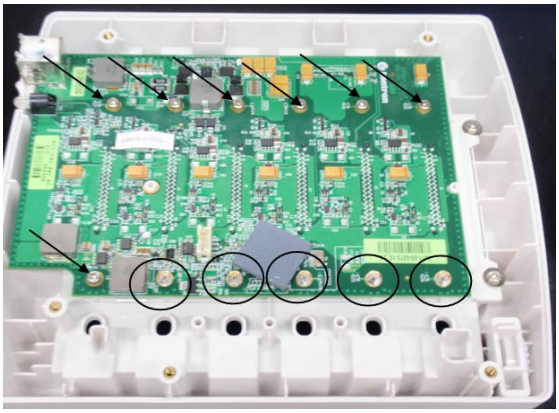
1. Remove the lock assembly.
2. Remove the module locking bracket.



3. Remove the 12 M3X8 screws to remove the V Hub PCBA, if the V Hub PCBA is the one as shown below.

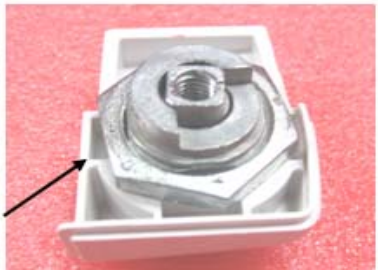


Remove the 7 M3X8 pan head screws and 5 M3X8 plastic screws to remove the V Hub PCBA, if the V Hub PCBA is the one as shown below.



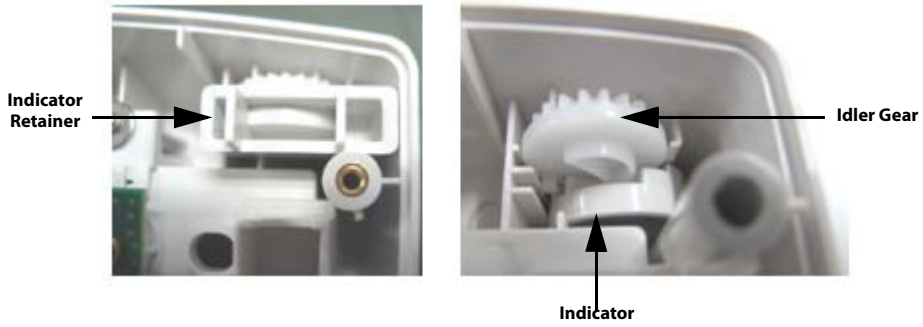
Removal of the Lock

1. Remove the bolt and the nut.
2. Remove the module locking cam and the lock assembly housing.



Removal of the Lock/Unlock indicate wheel

1. Remove the indicator retainer and the idler gear.
2. Remove the indicator.



2.5.8 Disassembling VPS Module

Removal of the Front Housing

1. Remove the 4 M3X10 screws that secure the front housing.

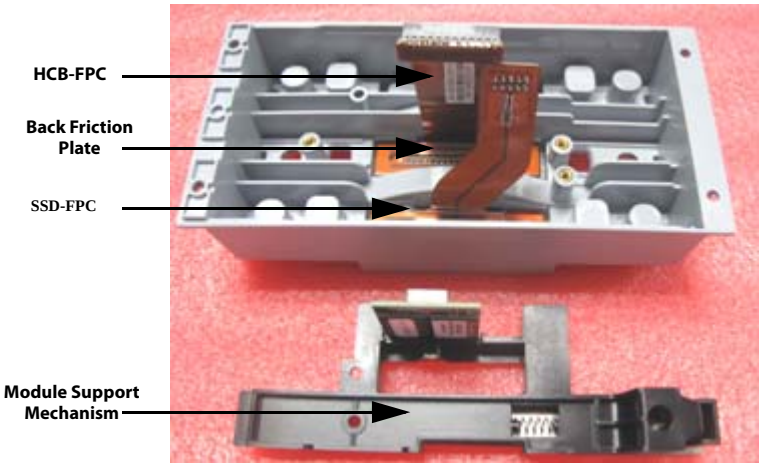
2. Pull off the front housing from the back housing.

3. Remove the HCB module bay Interface FPC(HCB-FPC) from J1 of the isolator host communication PCBA.

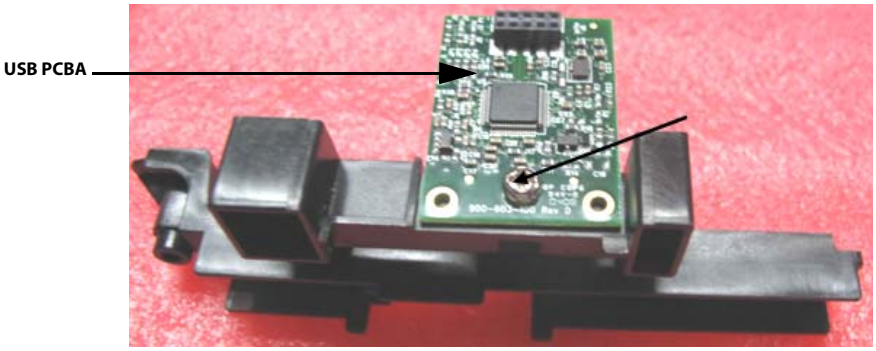
Removal of the HCB Module Bay Interface FPC(HCB-FPC)/ the SSD Module Bay Interface FPC(SSD-FPC)/USB PCBA

1. Remove the SSD-FPC from J1 of USB PCBA.
2. Remove the 3 M3X8 screws that secure the latch.

3. Remove the module latch and the module support mechanism.
4. Remove the back friction plate.
5. Remove the SSD-FPC and HCB-FPC.



6. Remove the M3X8 screw that secures the USB PCBA.



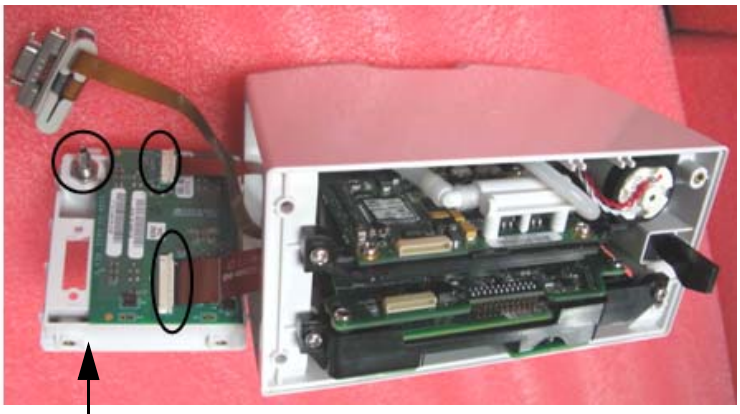
Removal of the Patient Connector Interface Assembly

1. Remove the 2 M2.5X4 screws that secure the SpO_2 connector.

2. Remove the tube from the NIBP fitting.

3. Unlatch the socket and remove ECG_RESP flex cable from J2 of the patient connector interface PCBA.

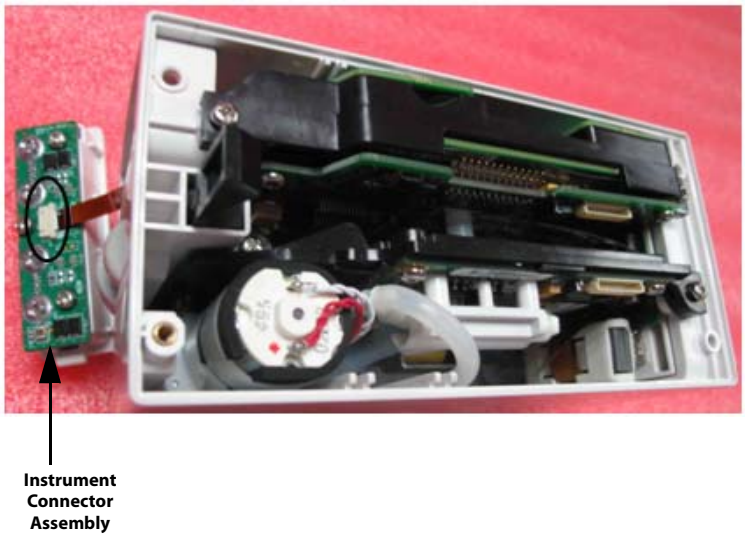
4. Unlatch the socket and remove IBP_TEMP flex cable from J1 of the patient connector interface PCBA.



Patient Connector Interface Assembly

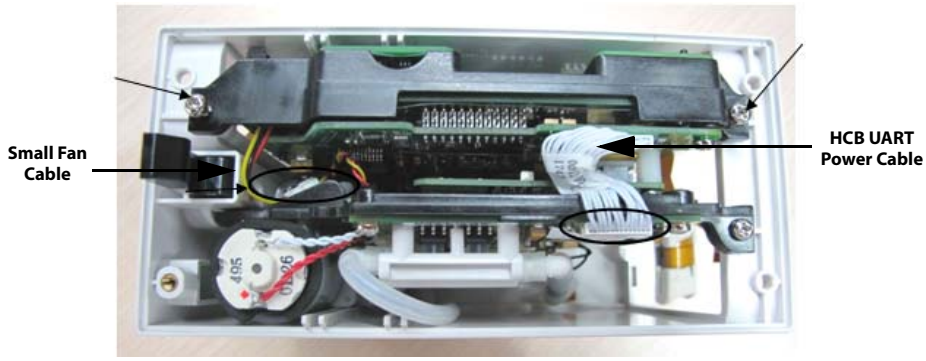
Removal of the Instrument Connector Assembly

1. Pull out the instrument connector assembly.
2. Unlatch the connectors and remove instrument connector flex cable from J1.

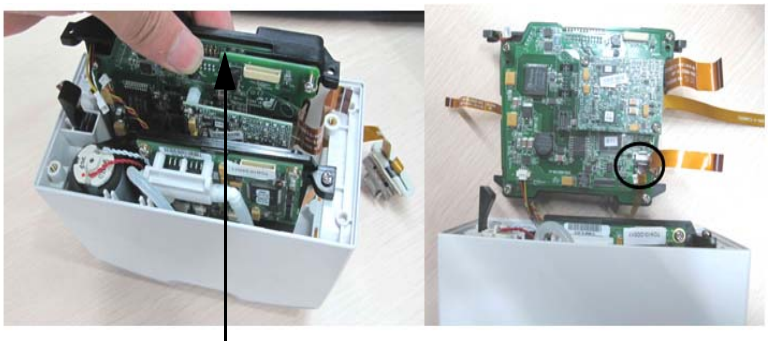


Removal of the SpO_2 PCBA/Isolator Host Communication PCBA / ECG_RESP_DSP PCBA/ IBP_TEMP_ AnalogOut PCBA

1. Remove the 2 M3X6 screws that secure the ECG/IBP/SpO_2 assembly. Remove the HCB UART/ POWER cable from J2 of NIBP PCBA. Remove the small fan cable from the socket.



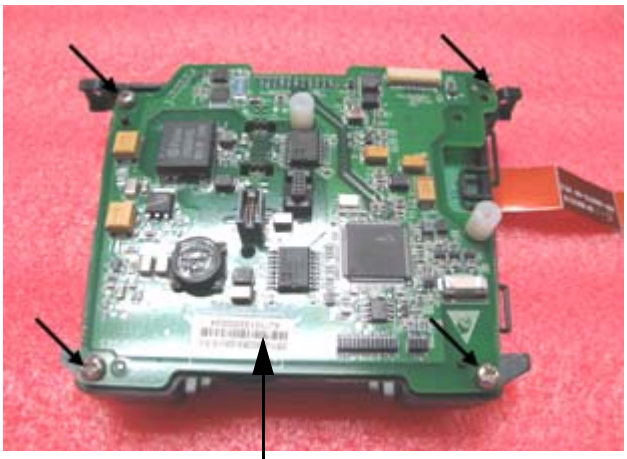
2. Pull out the ECG/IBP/SpO_2 assembly from the back housing. Unlatch the socket and remove keypad cable from J2 of the isolator host communication PCBA.



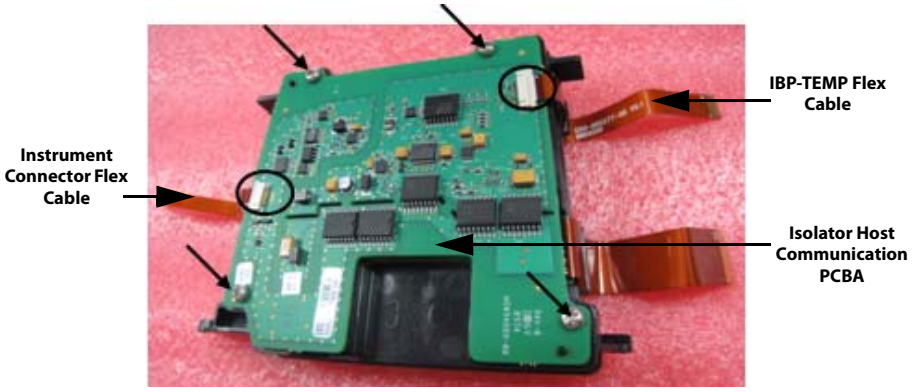
ECG/IBP/SpO_2 Assembly

3. Remove the 2 M3X4 screws and then remove the SpO_2 PCBA.
4. Remove the SpO_2 cable assembly.

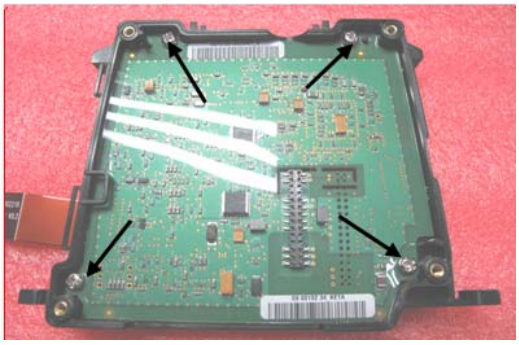
5. Remove the 4 M3X6 screws that secure the isolator host communication PCBA.
6. Hold the PCBA and pull it off cautiously.



7. Unlatch the socket and remove instrument connector flex cable from J2 of the IBP_TEMP_ AnalogOut PCBA.
8. Unlatch the socket and remove IBP_TEMP flex cable from J11 of the IBP_TEMP_ AnalogOut PCBA.
9. Remove the 4 M3X6 screws that secure the IBP_TEMP_ AnalogOut PCBA.
10. Hold the PCBA and remove it cautiously.



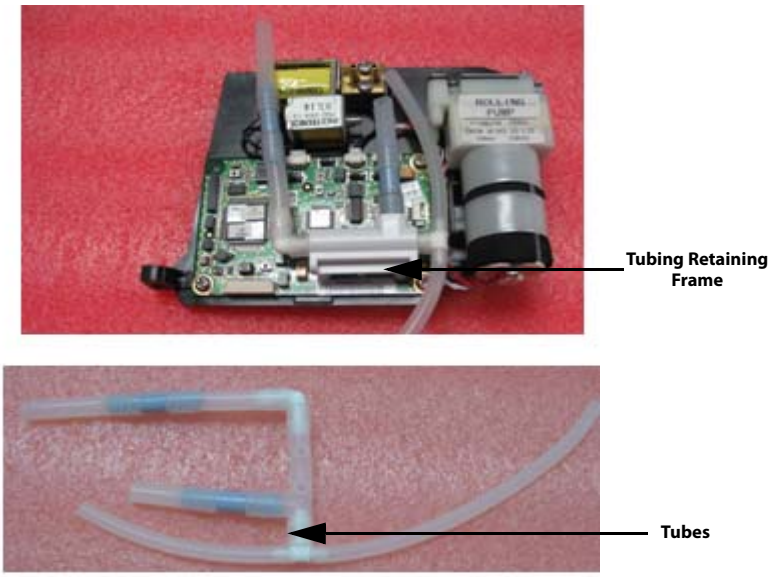
11. Remove the 4 M3X6 screws that secure the ECG_RESP_DSP PCBA.
12. Pull out the PCBA and unlatch the ECG_RESP Flex cable from J11 of the ECG_RESP_DSP PCBA.



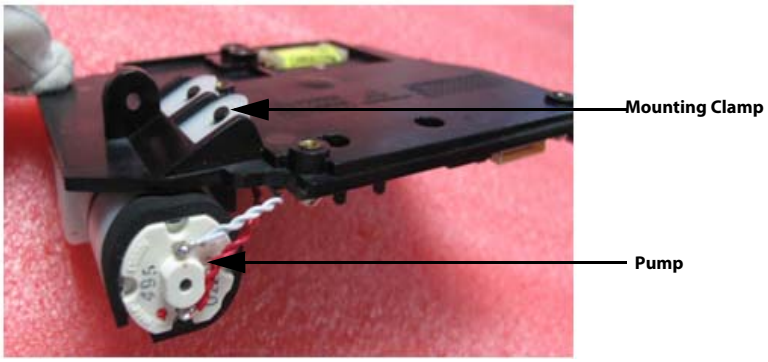
Removal of the NIBP Assembly

1. Remove the 2 M3X6 screws that secure the NIBP assembly. Pull the NIBP assembly out.

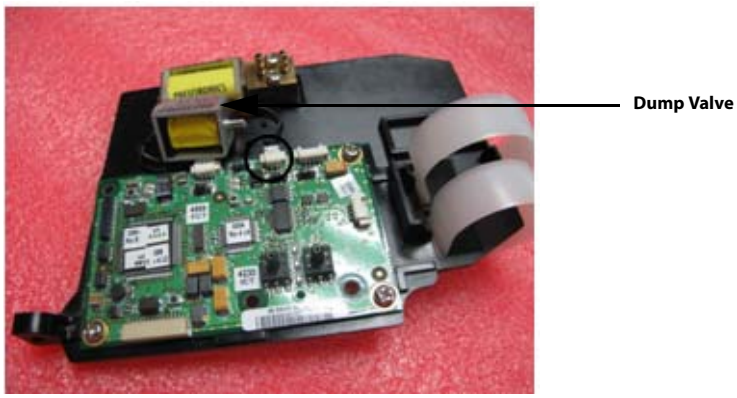
2. Remove the 2 M2.5X6 self-taping screws that secure the NIBP tubing retaining frame.
3. Remove the tubes from the fitting of the Linear Bleed Valve, the pump valve and the pump.



4. Remove the pump cable from J4 of the NIBP PCBA. Open the 2 mounting clamps that secure the pump.

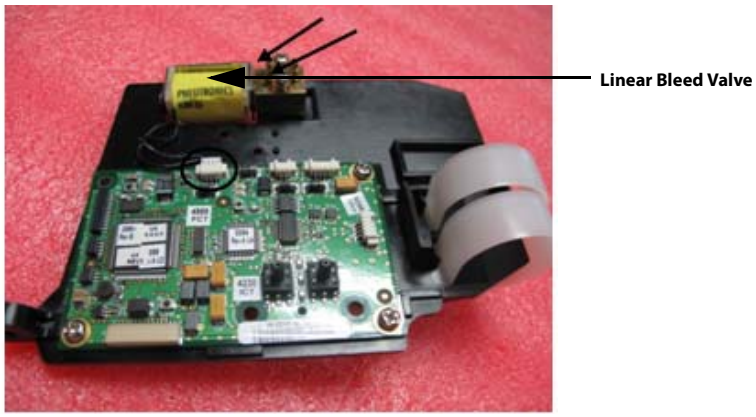


5. Remove the 2 M2x4 screws that secure the dump valve.
6. Remove the dump valve cable from J7 of the NIBP PCBA.



7. Remove the 2 M3X16 screws and 2 M3 nuts.

8. Remove the linear bleed valve cable from J8 of the NIBP PCBA.



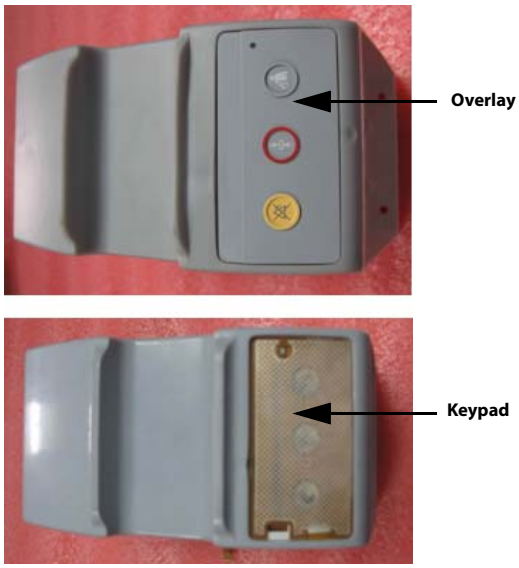
9. Remove the 3 M3X6 screws that secure the NIBP PCBA.

10. Remove the 2 M2.5X16 screws that secure the small fan.

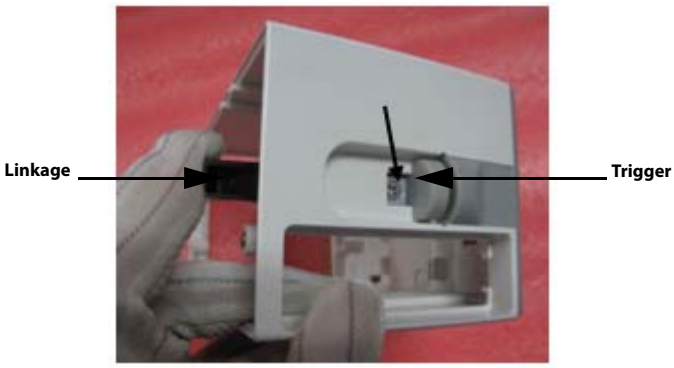
Removal of the Keypad

Tear off the overlay and the keypad with your fingers.

Removal of the Module Unlatching Trigger



1. Push the linkage to compress the spring and remove the M3X8 screw.
2. Remove the linkage and the trigger.



2.5.9 Disassembling CO_2 Module

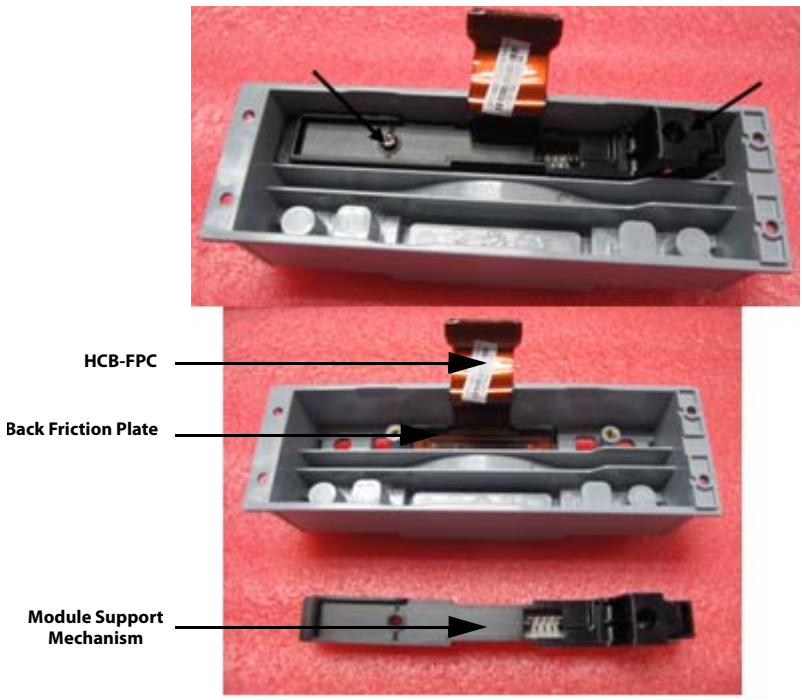
Removal of the Front Housing

1. Remove the 4 M3X10 screws that secure the front housing.

2. Separate the front housing from the back housing.
3. Remove the HCB-FPC from J1 of the non-isolated host communications PCBA.

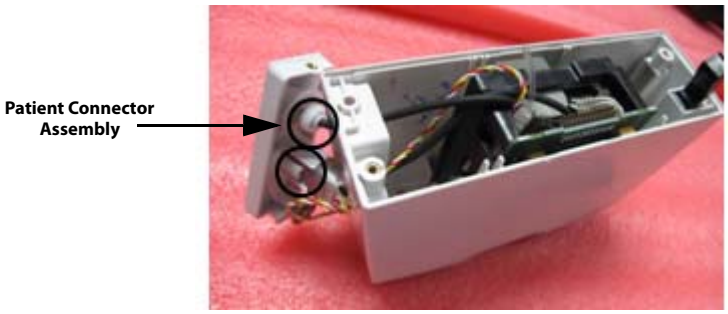
Removal of the HCB Module Bay Interface FPC (HCB-FPC)

1. Remove the 2 M3X8 screws that secure the latch.
2. Remove the module latch and the module support mechanism.
3. Remove the back friction plate.
4. Remove the HCB-FPC.



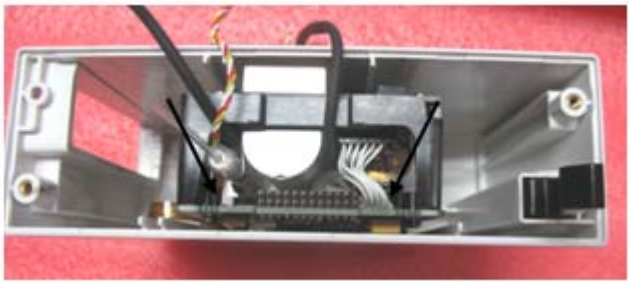
Removal of the Patient Connector Assembly

1. Remove the tube from the CO_2 pneumatic fitting.
2. Use a small blade screw driver to unclench the buckle that secure the CO_2 input fitting.

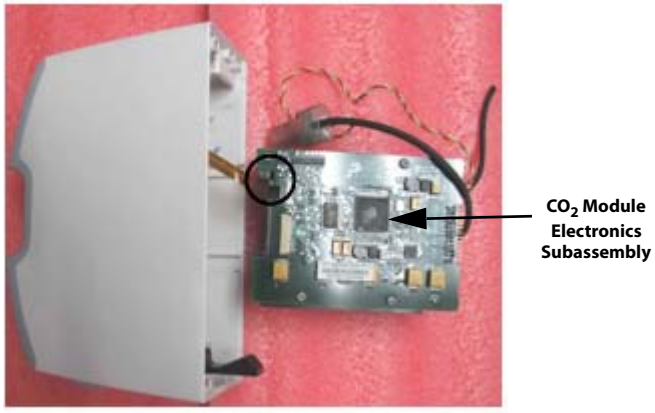


Removal of the CO_2 Module Electronics Subassembly

1. Loosen the 2 M3X10 captive screws inside the bottom of the back housing.

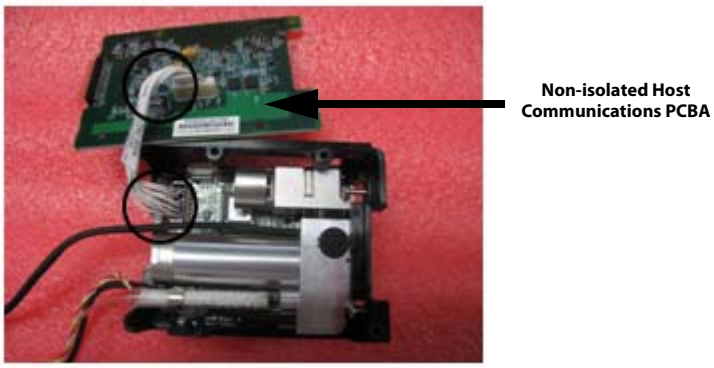


2. Pull out the CO_2 module electronics subassembly.
3. Unlatch the socket and remove the keypad cable from J2 of the non-Isolated host communications PCBA.



Removal of the Non-Isolated Host Communications/CO_2 Module

1. Remove the 4 M2.6X6 self tapping screws that secure the non-Isolated host communications PCBA.
2. Remove the CO_2 HCB UART/POWER cable from J4 of the CO_2 module.



3. Remove the 4 M2.6X6 self tapping screws that secure the CO_2 module

2.5.10 Disassembling 1X Module

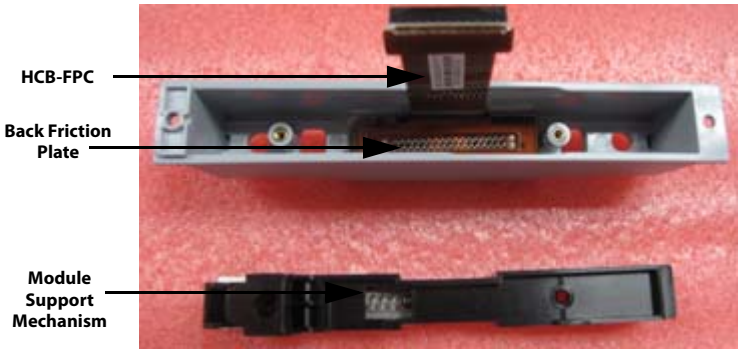
Removal of the Front Housing

1. Remove the 2 M3X10 screws that secure the front housing.

2. Pull off the front housing from the back housing. Remove the HCB-FPC from J1 of the host communications PCBA.

Removal of the HCB Module Bay Interface FPC (HCB-FPC)

1. Remove the 2 M3X8 screws that secure the latch.
2. Remove the module latch and the module support mechanism.
3. Remove the back friction plate.
4. Remove the HCB-FPC.

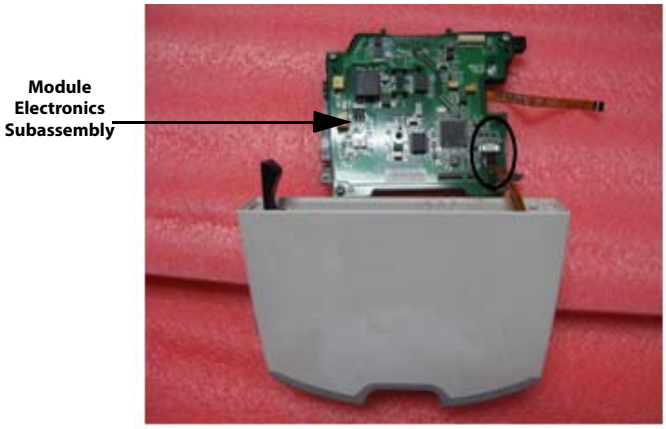


Removal of the Patient Connector Assembly

Remove the cable from the socket of the patient connector PCBA.

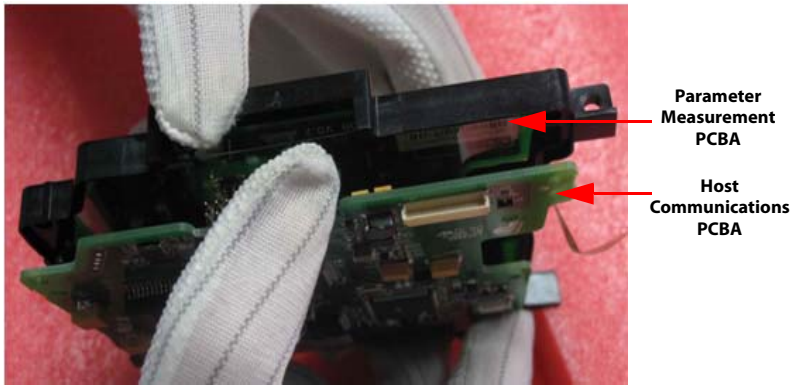
Removal of the Module Electronics Subassembly

1. Remove the 1 screw that secures the module electronics subassembly.
2. Remove the module electronics subassembly from the back housing.
3. Unlatch the socket and remove the keypad cable from J2 of the host communications PCBA.



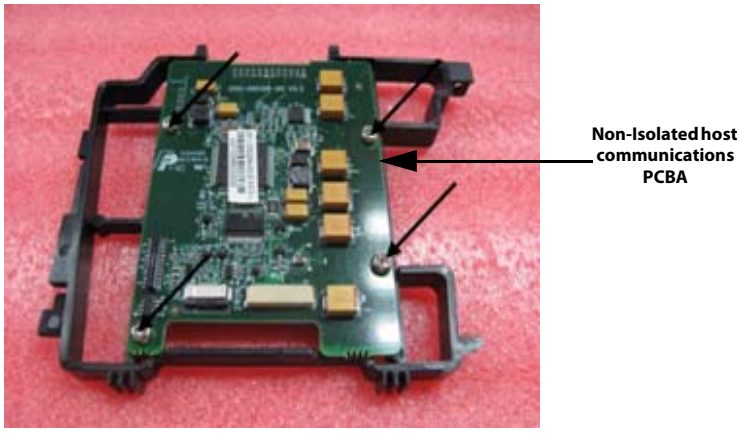
4. Remove the 4 screws and 4 nuts that secure the host communications PCBA.

5. Separate the host communications PCBA and the parameter measurement PCBA.



Removal of the Non-Isolated Host Communications PCBA (Serial Port Module only)

Remove the 4 screws that secure the non-Isolated host communications PCBA.



2.5.11 Disassembling Recoder Module

Removal of the Front Housing

1. Remove the 4 screws that secure the front housing.

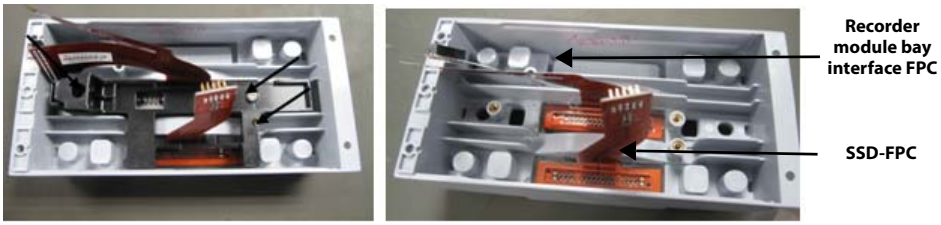
2. Pull off the front housing from the back housing.

3. Remove the HCB module bay interface FPC(HCB-FPC) from J1 of the isolator host communication PCBA.

4. Remove the Recorder module bay interface FPC from J1 and J3 of the recorder.

Removal of the HCB-FPC/ Recorder Module Bay Interface FPC

1. Remove the 3 M3X8 screws that secure the latch.
2. Remove the module latch and the module support mechanism.
3. Remove the back friction plate.
4. Remove the SSD-FPC and the Recorder module bay Interface FPC.

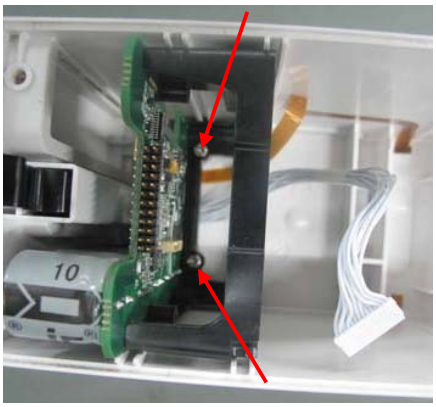


Removal of the Recorder

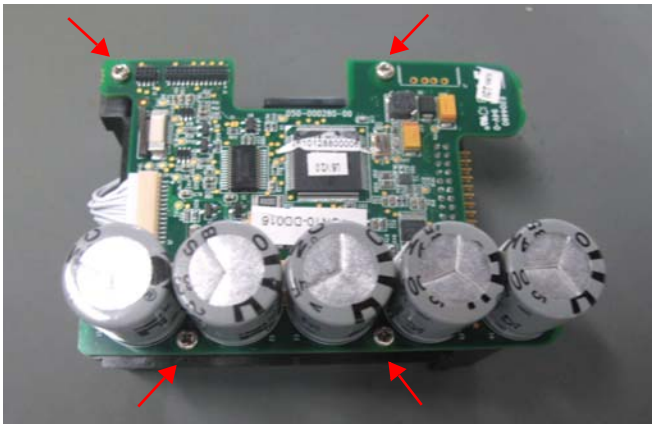
1. Remove the recorder HCBUART/Power cable assembly from J2 of the recorder PCBA.
2. Open the recorder door and carefully remove the recorder assembly.

Removal of the Non-Isolated Host Communications PCBA

1. Loosen the 2 M3X10 captive screws inside the bottom of the back housing.
2. Pull out the CO_2 module electronics subassembly.



3. Remove the 4 M2.6X6 self tapping screws that secure the non-Isolated host communications PCBA.



2.5.12 Disassembling 12-Lead ECG Module

Removal of the Top Housing

1. Remove the top label and remove the 4 M3X16 screws that secure the top housing.
2. Separate the top housing and the bottom housing.

Removal of the 12-Lead Resp Board and the 12-Lead ECG Board

1. Separate the 12 -Lead Resp board and the 12-Lead ECG board

2. Remove the 12-Lead ECG board from the bottom housing.

Removal of the Patient Cable of the 12L ECG Module / the Monitor Cable of the 12L ECG Module

1. Remove the patient cable from J1 of the 12L ECG board.

2. Remove the monitor cable from J4 of the 12L Resp board.

2.6 Cable Wiring Diagrams

2.6.1 Nurse Call Cable (3 Pin Circular to Unterminated)

P/N 0012-00-1277-01/-02

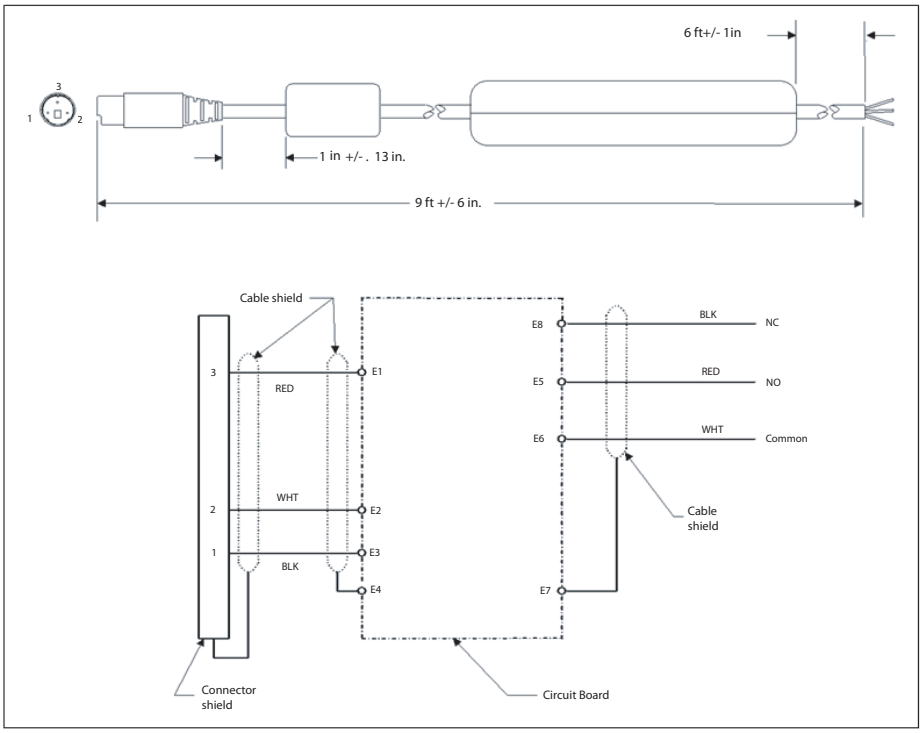


FIGURE 2-1 Nurse Call Cable (3 Pin Circular to Unterminated)

2.6.2 Defib Synch Cable

P/N 0012-00-1801-01

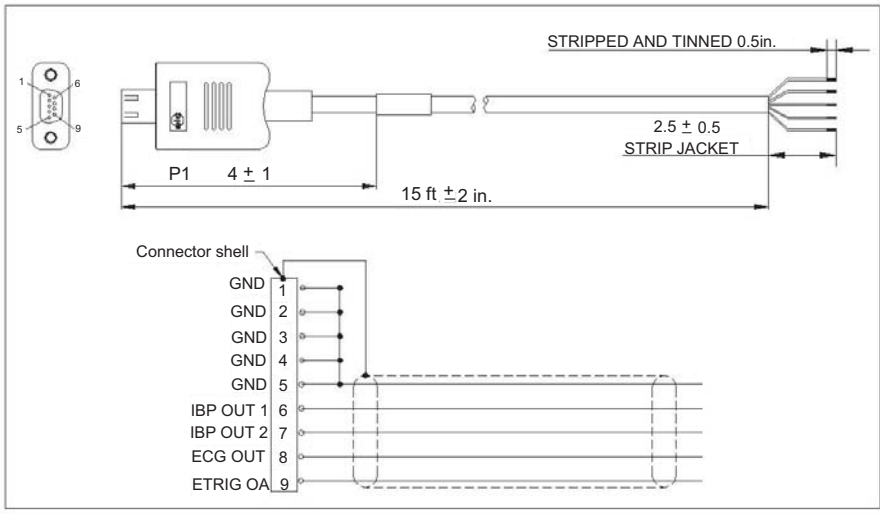


FIGURE 2-2 Defib Synch Cable

2.6.3 Serial Port to Serial Port Cable

P/N 0012-00-1275-01

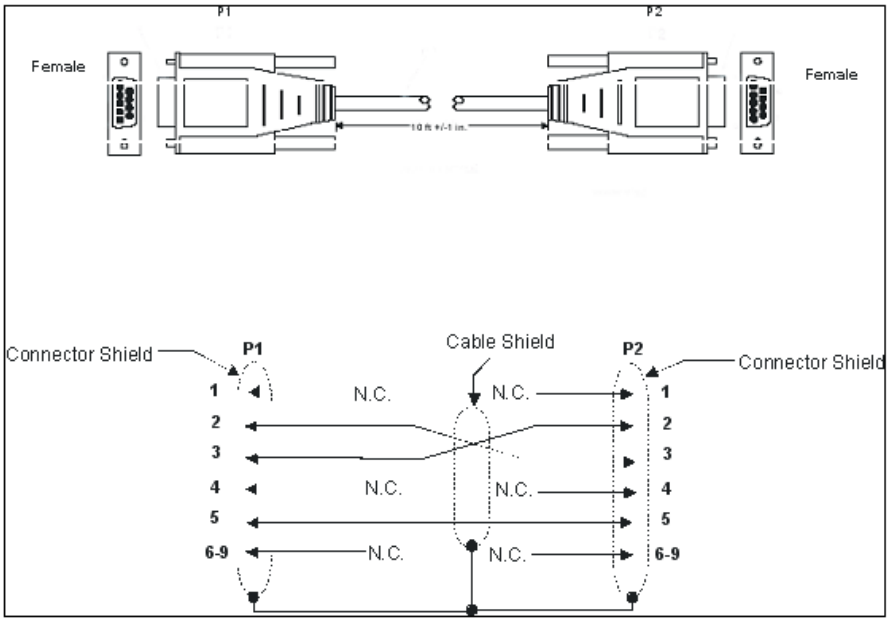
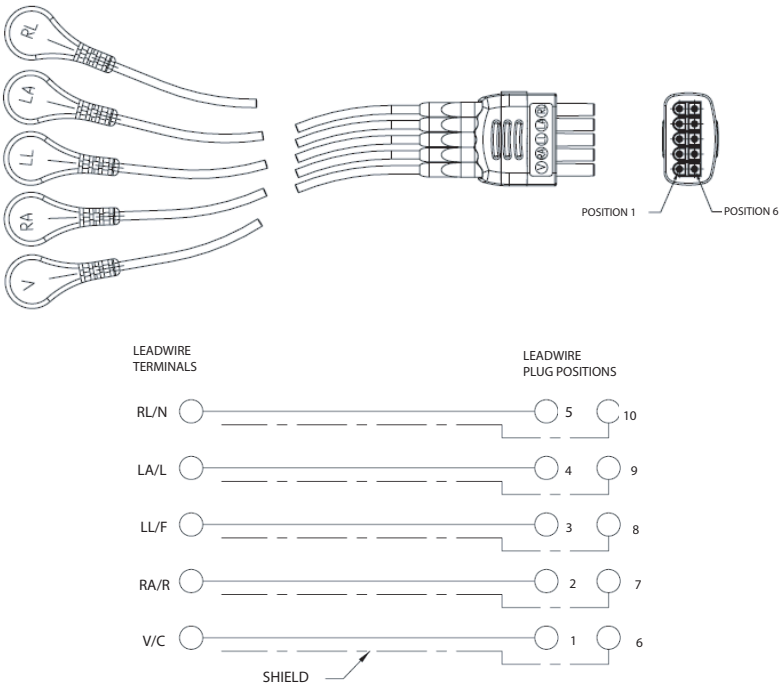


FIGURE 2-3 Serial Port to Serial Port Cable

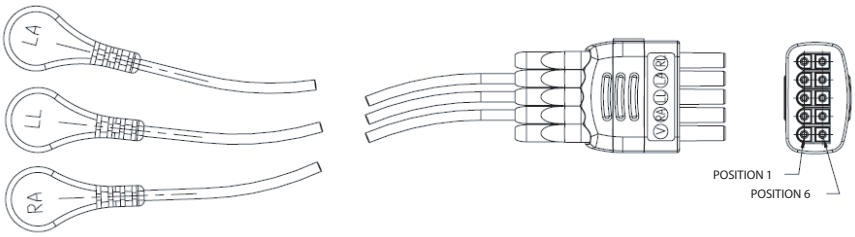
2.6.4 ECG Shielded Lead Wires

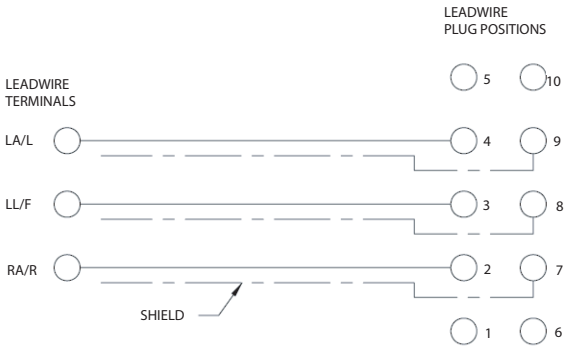
2.6.4.1 3/5 Lead ECG Leadset

Leadset, ECG, 3/5 Lead, Snap



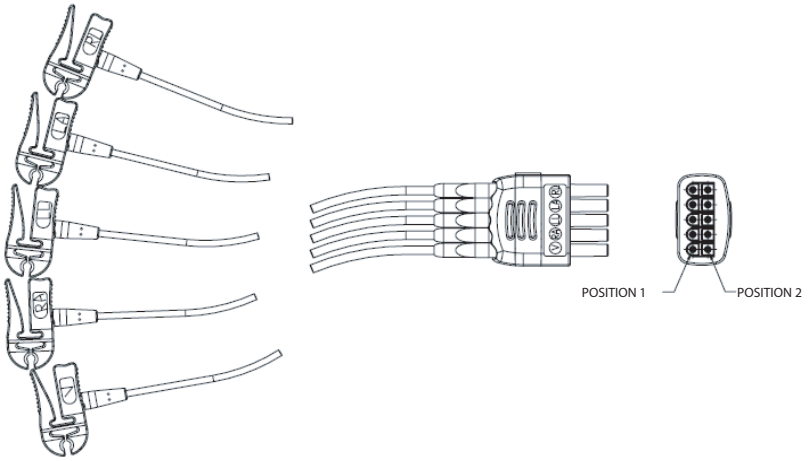
PART NUMBER	DESCRIPTION
0012-00-1503-01	Leadset, ECG, 5 Lead, Snap, AAMI, 18″
0012-00-1503-02	Leadset, ECG, 5 Lead, Snap, AAMI, 24″
0012-00-1503-03	Leadset, ECG, 5 Lead, Snap, AAMI, 36″
0012-00-1503-10	Leadset, ECG, 5 Lead, Snap, IEC, 18″
0012-00-1503-11	Leadset, ECG, 5 Lead, Snap, IEC, 24″
0012-00-1503-12	Leadset, ECG, 5 Lead, Snap, IEC, 36″

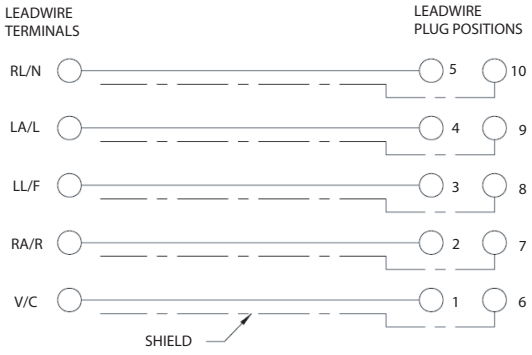




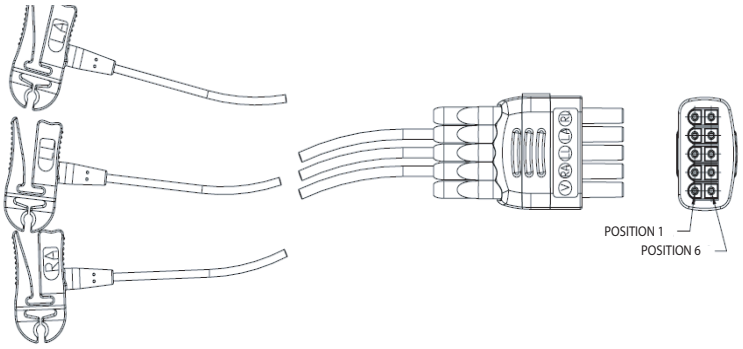
PART NUMBER	DESCRIPTION
0012-00-1503-04	Leadset, ECG, 3 Lead, Snap, AAMI, 18”
0012-00-1503-05	Leadset, ECG, 3 Lead, Snap, AAMI, 24”
0012-00-1503-06	Leadset, ECG, 3 Lead, Snap, AAMI, 36”
0012-00-1503-13	Leadset, ECG, 3 Lead, Snap, IEC, 18”
0012-00-1503-14	Leadset, ECG, 3 Lead, Snap, IEC, 24”
0012-00-1503-15	Leadset, ECG, 3 Lead, Snap, IEC, 36”

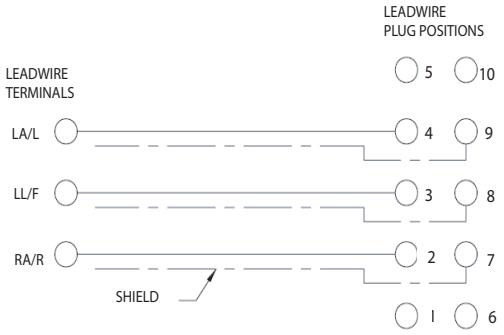
Leadset, ECG, 3/5 Lead, Pinch





PART NUMBER	DESCRIPTION
0012-00-1514-01	Leadset, ECG, 5 Lead, Pinch, AAMI, 18”
0012-00-1514-02	Leadset, ECG, 5 Lead, Pinch, AAMI, 24”
0012-00-1514-03	Leadset, ECG, 5 Lead, Pinch, AAMI, 36”
0012-00-1514-10	Leadset, ECG, 5 Lead, Pinch, IEC, 18”
0012-00-1514-11	Leadset, ECG, 5 Lead, Pinch, IEC, 24”
0012-00-1514-12	Leadset, ECG, 5 Lead, Pinch, IEC, 36”

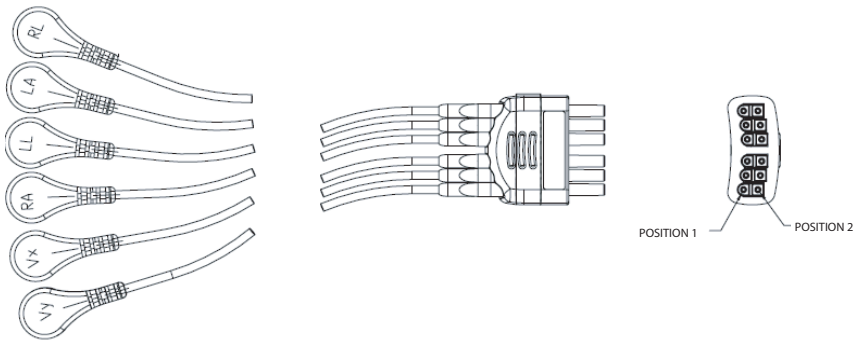


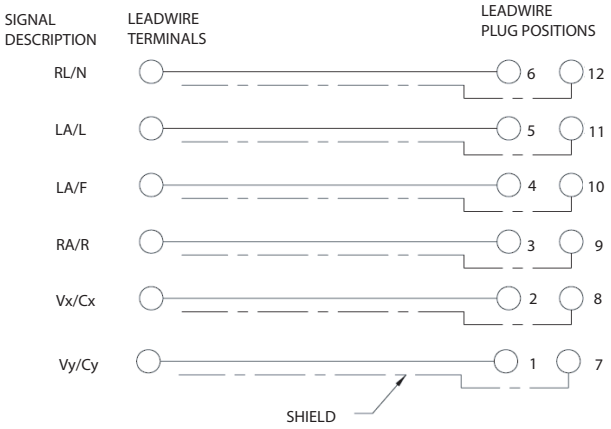


PART NUMBER	DESCRIPTION
0012-00-1514-04	Leadset, ECG, 3 Lead, Pinch, AAMI, 18″
0012-00-1514-05	Leadset, ECG, 3 Lead, Pinch, AAMI, 24″
0012-00-1514-06	Leadset, ECG, 3 Lead, Pinch, AAMI, 36″
0012-00-1514-13	Leadset, ECG, 3 Lead, Pinch, IEC, 18″
0012-00-1514-14	Leadset, ECG, 3 Lead, Pinch, IEC, 24″
0012-00-1514-15	Leadset, ECG, 3 Lead, Pinch, IEC, 36″

2.6.4.2 6-Lead ECG Leadset

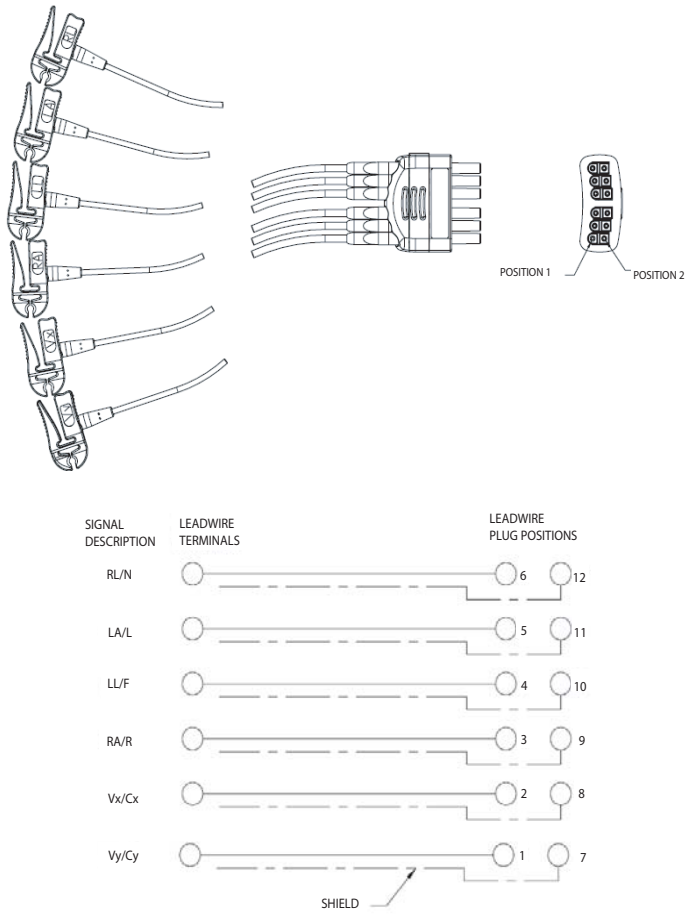
Leadset, ECG, 6 Lead, Snap





PART NUMBER	DESCRIPTION
0012-00-1773-01	Leadset, ECG, 6 Lead, Snap, AAMI, 18”
0012-00-1773-02	Leadset, ECG, 6 Lead, Snap, AAMI, 24”
0012-00-1773-03	Leadset, ECG, 6 Lead, Snap, AAMI, 36”
0012-00-1773-11	Leadset, ECG, 6 Lead, Snap, IEC, 18”
0012-00-1773-12	Leadset, ECG, 6 Lead, Snap, IEC, 24”
0012-00-1773-13	Leadset, ECG, 6 Lead, Snap, IEC, 36”

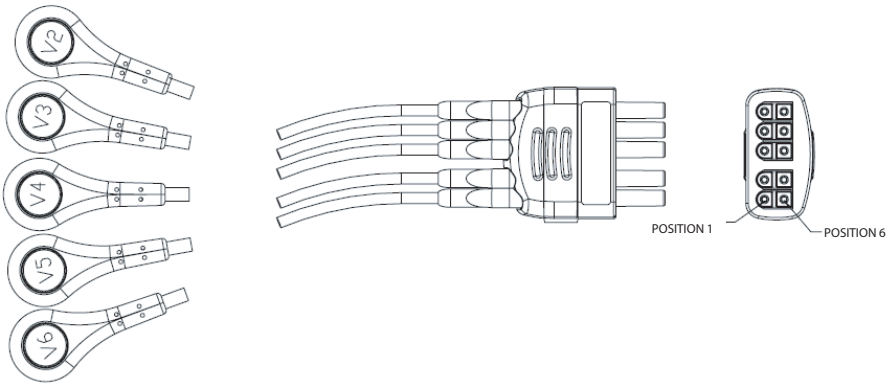
Leadset, ECG, 6 Lead, Pinch

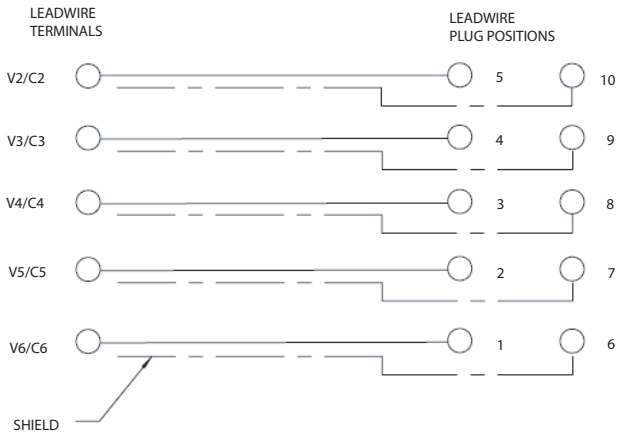


PART NUMBER	DESCRIPTION
0012-00-1816-01	Leadset, ECG, 6 Lead, Pinch, AAMI, 18”
0012-00-1816-02	Leadset, ECG, 6 Lead, Pinch, AAMI, 24”
0012-00-1816-03	Leadset, ECG, 6 Lead, Pinch, AAMI, 36”
0012-00-1816-11	Leadset, ECG, 6 Lead, Pinch, IEC, 18”
0012-00-1816-12	Leadset, ECG, 6 Lead, Pinch, IEC, 24”
0012-00-1816-13	Leadset, ECG, 6 Lead, Pinch, IEC, 36”

2.6.4.3 Extension Lead ECG Leadset

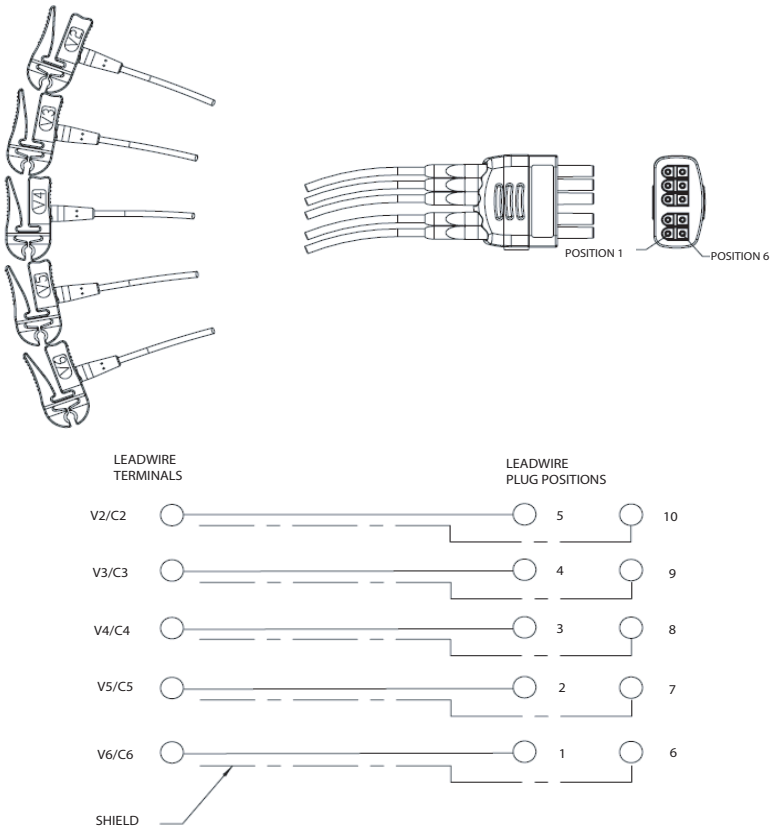
Leadset, ECG, Extension, Snap





PART NUMBER	DESCRIPTION
0012-00-1818-01	Leadset, ECG, Extension, Snap, AAMI, 18"
0012-00-1818-02	Leadset, ECG, Extension, Snap, AAMI, 24"
0012-00-1818-03	Leadset, ECG, Extension, Snap, AAMI, 36"
0012-00-1818-10	Leadset, ECG, Extension, Snap, IEC, 18"
0012-00-1818-11	Leadset, ECG, Extension, Snap, IEC, 24"
0012-00-1818-12	Leadset, ECG, Extension, Snap, IEC, 36"

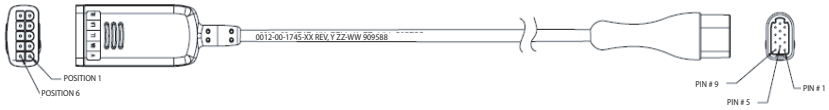
Leadset, ECG, Extension, Pinch



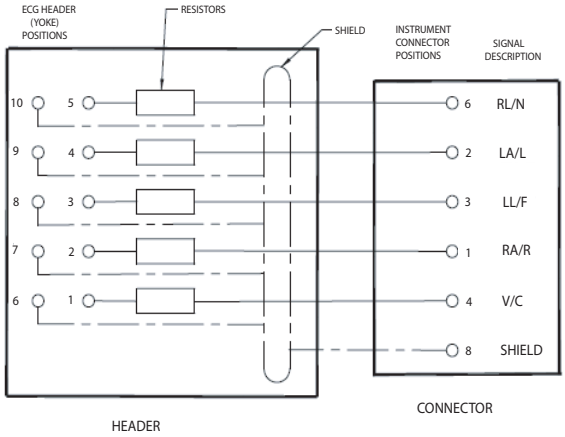
PART NUMBER	DESCRIPTION
0012-00-1820-01	Leadset, ECG, Extension, Pinch, AAMI, 18″
0012-00-1820-02	Leadset, ECG, Extension, Pinch, AAMI, 24″
0012-00-1820-03	Leadset, ECG, Extension, Pinch, AAMI, 36″
0012-00-1820-10	Leadset, ECG, Extension, Pinch, IEC, 18″
0012-00-1820-11	Leadset, ECG, Extension, Pinch, IEC, 24″
0012-00-1820-12	Leadset, ECG, Extension, Pinch, IEC, 36″

2.6.5 ECG Cable ESIS and Non ESIS

2.6.5.1 3/5-Lead ECG Cable

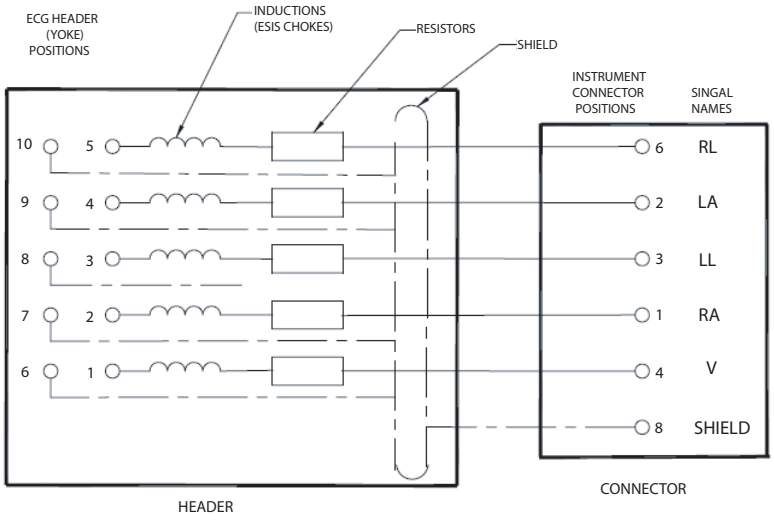


NON ESIS



PART NUMBER	DESCRIPTION
0012-00-1745-01	3/5-Lead ECG Cable, Non-ESIS, 10 ft
0012-00-1745-02	3/5-Lead ECG Cable, Non-ESIS, 20 ft

ESIS

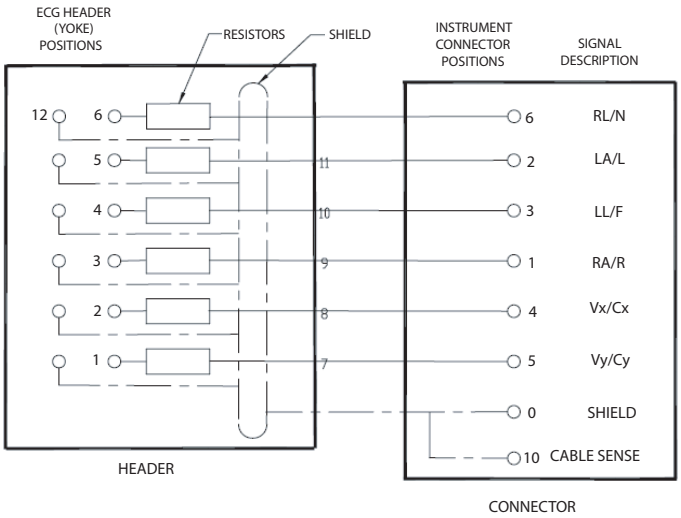


PART NUMBER	DESCRIPTION
0012-00-1745-03	3/5-Lead ECG Cable, ESIS, 10 ft
0012-00-1745-04	3/5-Lead ECG Cable, ESIS, 20ft

2.6.5.2 6-Lead ECG Cable

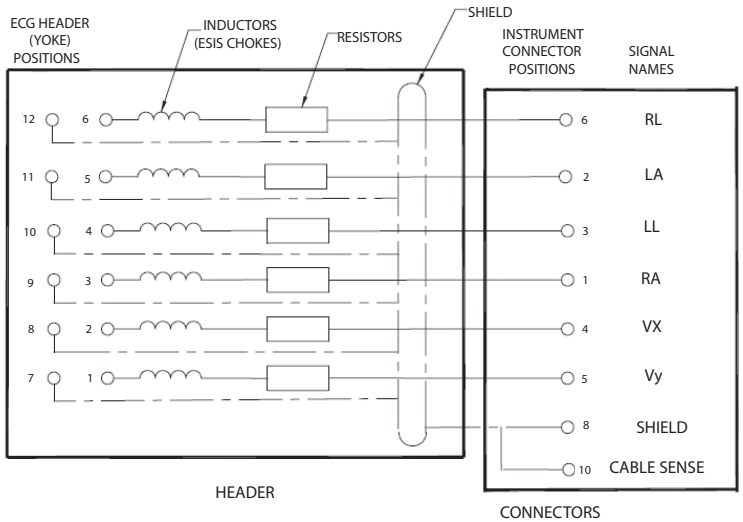
P/N 0012-00-1746-XX

NON-ESIS



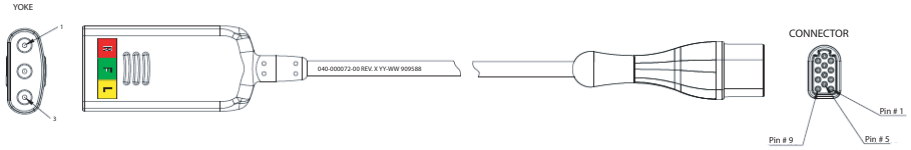
PART NUMBER	DESCRIPTION
0012-00-1746-01	6-Lead ECG Cable, Non-ESIS, 10 ft
0012-00-1746-02	6-Lead ECG Cable, Non-ESIS, 20ft

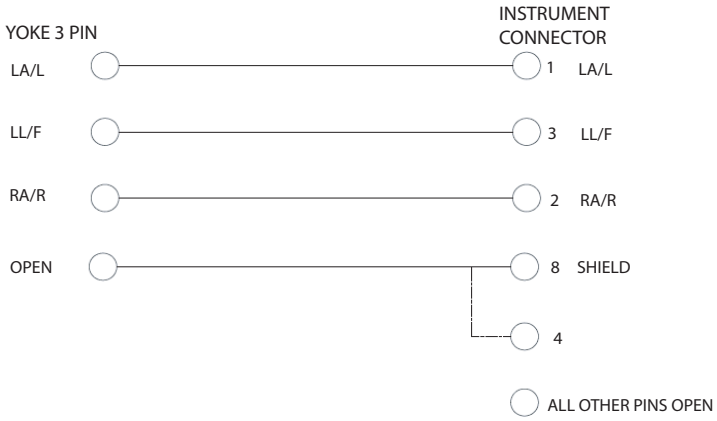
ESIS



PART NUMBER	DESCRIPTION
0012-00-1746-03	6-Lead ECG Cable, ESIS, 10 ft
0012-00-1746-04	6-Lead ECG Cable, ESIS, 20ft

2.6.5.3 Neonatal ECG Cable



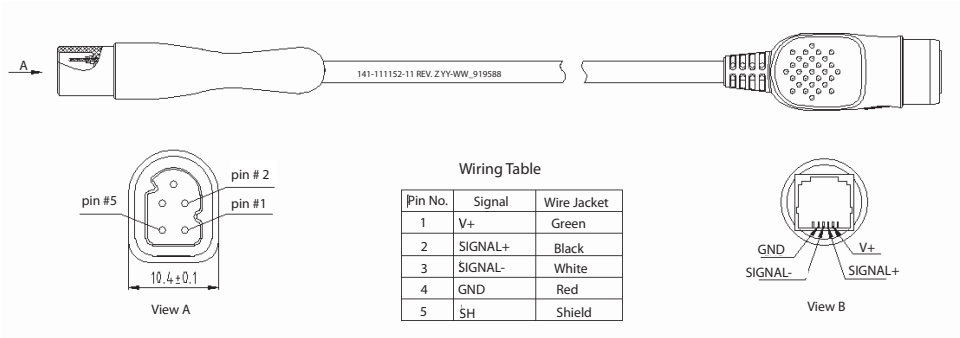


PART NUMBER	DESCRIPTION
040-000072-00	Neonatal ECG Cable, 3-Lead

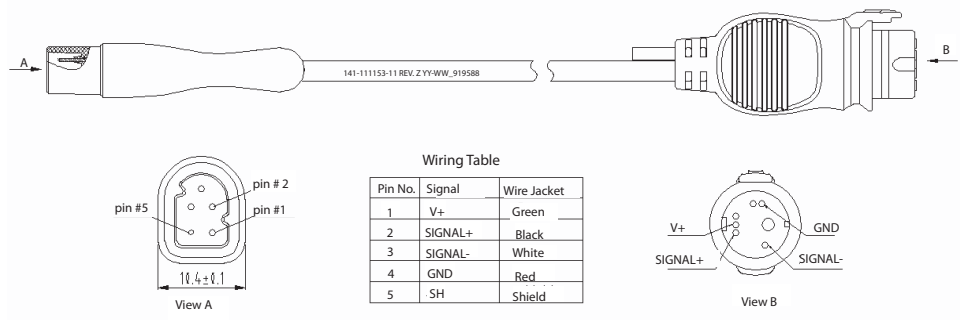
2.6.6 IBP Cable

PART NUMBER	DESCRIPTION
040-000052-00	IBP Cable, Hospira, Transpac IV, 12ft
040-000053-00	IBP Cable, BD P10EZ-1, P23XL-1, DTX/Plus, 12ft
040-000054-00	IBP Cable, Edwards Life Sciences TruWave PX, 12ft
040-000096-00	IBP Cable Adapter

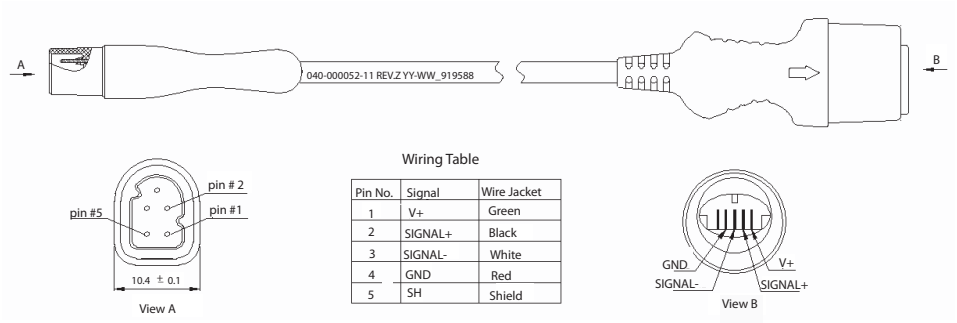
P/N 040-000052-00



P/N 040-000053-00



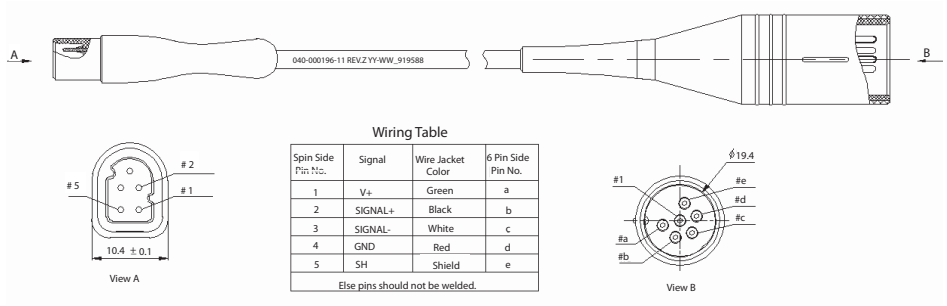
P/N 040-000054-00



Wiring Table

Pin No.	Signal	Wire Jacket
1	V+	Green
2	SIGNAL+	Black
3	SIGNAL-	White
4	GND	Red
5	SH	Shield

P/N 040-000096-00



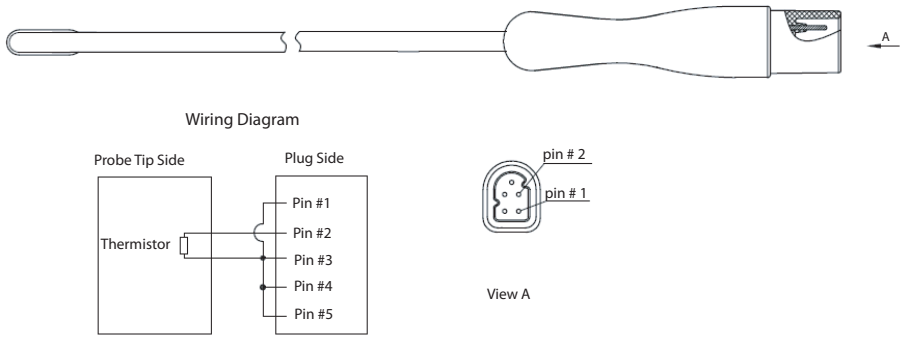
Wiring Table

Spin Side Pin No.	Signal	Wire Jacket Color	6 Pin Side Pin No.
1	V+	Green	a
2	SIGNAL+	Black	b
3	SIGNAL-	White	c
4	GND	Red	d
5	SH	Shield	e
Else pins should not be welded.			

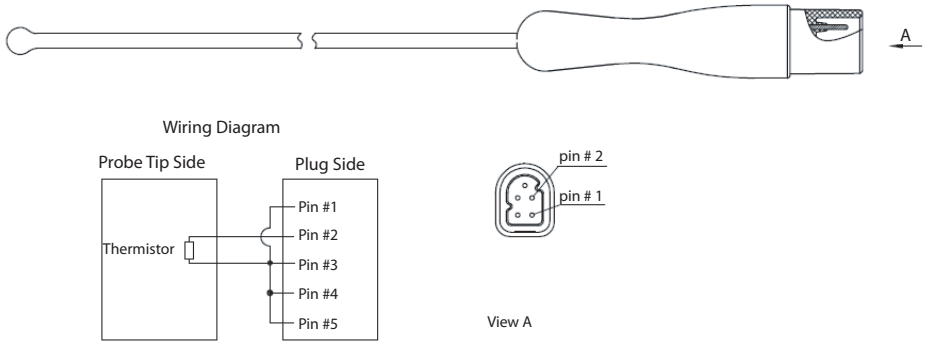
2.6.7 Temperature Cable

PART NUMBER	DESCRIPTION
040-000055-00	Reusable Temperature Probe, Adult, Esophageal/ Rectal
040-000056-00	Reusable Temperature Probe, Pediatric, Esophageal/Rectal
040-000057-00	Reusable Temperature Probe, Adult, Skin
040-000058-00	Reusable Temperature Probe, Pediatric/Neonatal, Skin
040-000091-00	Reusable Instrument Cable, 400 Series
040-000100-00	5 Pin Temp Adapter Cable

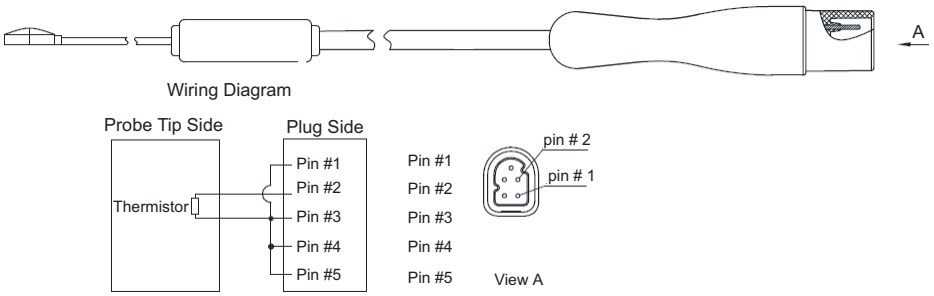
P/N 040-000055-00



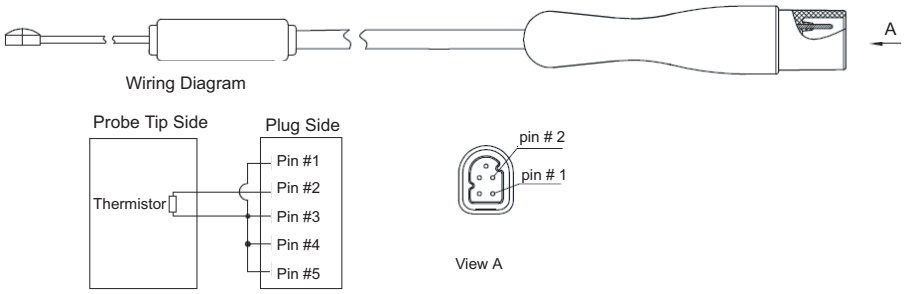
P/N 040-000056-00



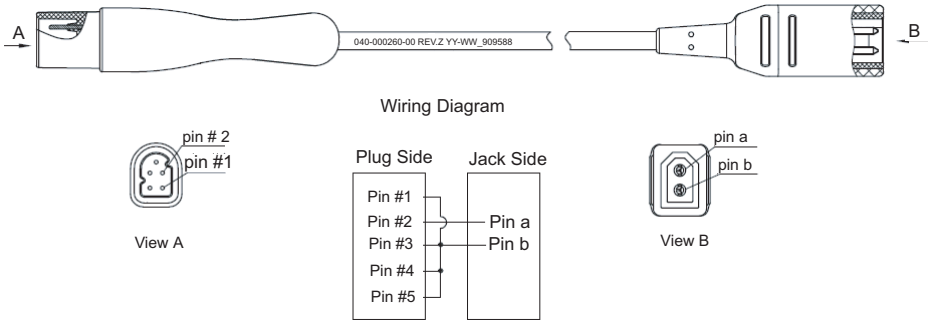
P/N 040-000057-00



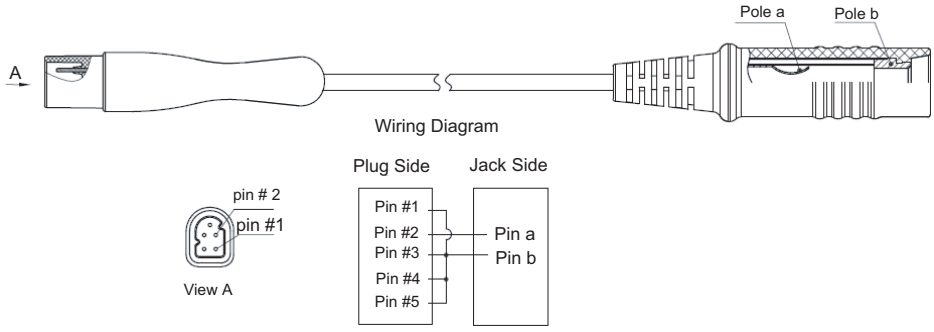
P/N 040-000058-00



P/N 040-000091-00



P/N 040-000100-00



2.6.8 IABP SYNC Cable

P/N 0012-00-1801-01

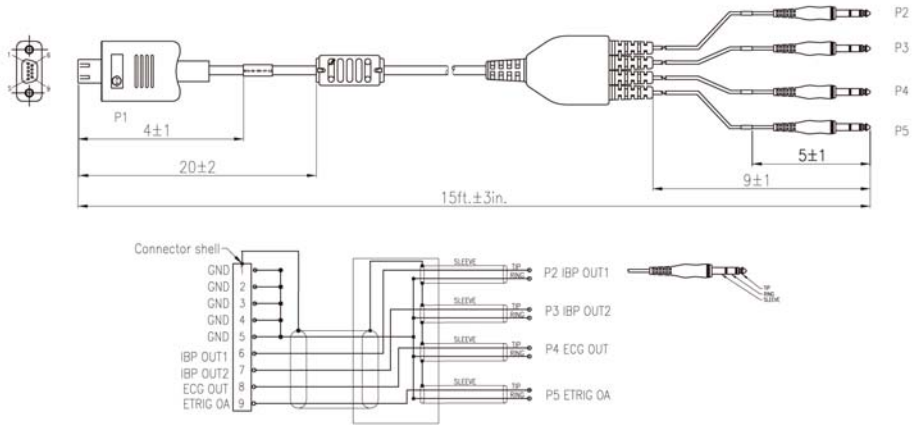


FIGURE 2-4 IABP SYNC Cable

2.6.9 Service Diagnostics Cable

P/N 009-001051-00

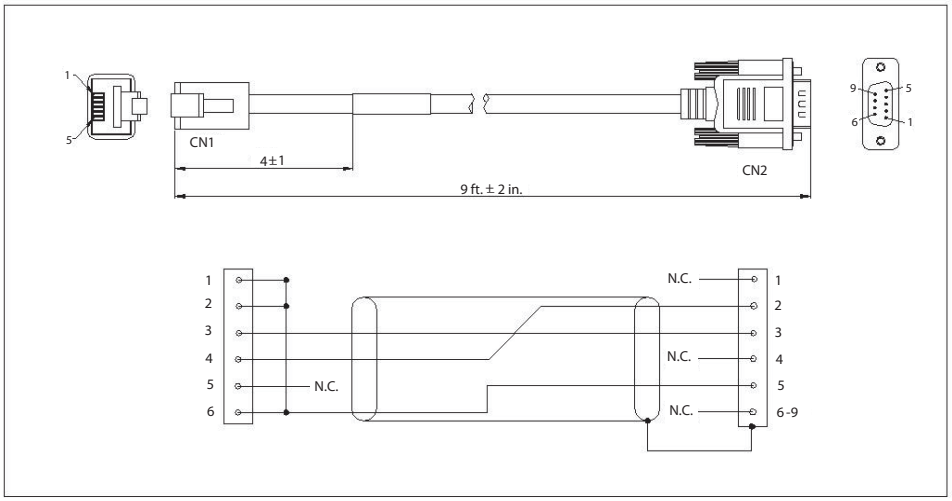


FIGURE 2-5 Service Diagnostics Cable

2.6.10 Powered USB Cable

P/N 0012-00-1803-XX

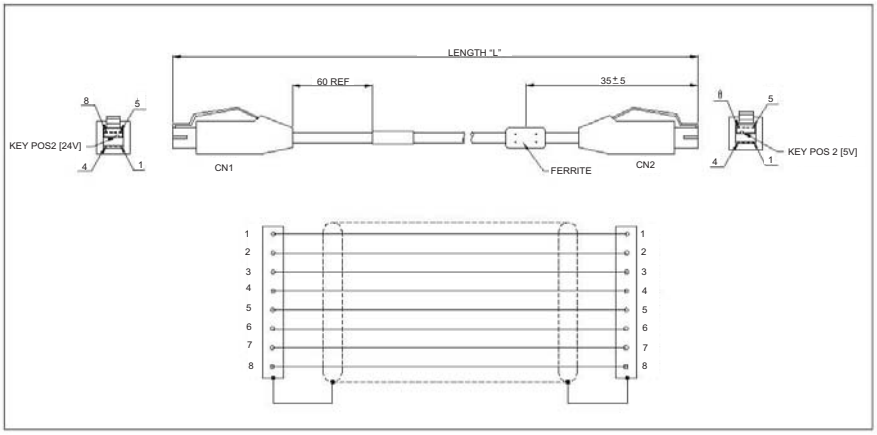
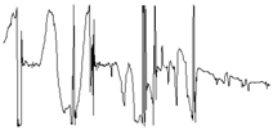
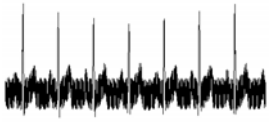


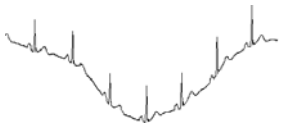
FIGURE 2-6 Powered USB Cable (P/N 0012-00-1803-XX)

PART NUMBER	POWER TYPE	LENGTH "L"
0012-00-1803-02	24V/5V	6 Feet
0012-00-1803-03	24V/5V	12 Feet
0012-00-1803-05	24V/5V	4 Feet

2.7 Troubleshooting

2.7.1 ECG Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Noisy ECG traces 	Loose or dry electrodes.	Apply fresh, moist electrodes.
	Defective electrode wires.	Replace wires as necessary.
	Patient cable or Leads are routed too close to other electrical devices.	Eliminate 60Hz interference.
Excessive electro-surgical interference	Wrong ECG cable used.	Use ESIS ECG cable with internal filter block. **NOTE:** Respiration monitoring via the ECG electrodes will not be available when using the cable.
Muscle noise 	Inadequate skin preparation prior to application of electrode, tremors, tense subject, and/or poor electrode placement.	Repeat skin preparation and electrode location procedures. Apply fresh, moist electrodes. Avoid areas of the torso that are very muscular.
Intermittent signal	Connections not tight and/or properly secured.	Ensure proper connection. (Electrode to Lead, Lead to cable, cable to monitor).
	Electrodes dry or loose.	Re-prep skin and apply fresh, moist electrodes.
	Cable or Lead wires damaged.	Check with continuity tester.
Excessive alarms: heart rate, Lead fault	Electrodes dry.	Re-prep skin and apply fresh, moist electrodes.
	Alarm limits set too close to patient's normal heart rate.	Readjust.
	R-wave wrong size.	Must have a higher amplitude than the other ECG waves, like the P and T waves.
	Excessive patient movement or muscle tremor.	Reposition electrodes and secure with tape, if necessary.
ECG noise	External interference	Check patient.
	Patient movement	Check electrode contacts/ reposition electrodes/cable. Check environment for source of interference.
No ECG waveform	Gain set too low.	Readjust as required.
	Lead wires and patient cable not fully or properly inserted.	Check for proper insertion.
	Cable or Lead wires damaged.	Check with Lead continuity tester.

MESSAGE/PROBLEM	REASON	SOLUTION
Base line wander 	Patient moving excessively.	Secure Lead wires and cable to patient.
	Patient's respiration.	Reposition electrodes.
	Electrodes dry or loose.	Re-prep skin and apply fresh, moist electrodes.
	Static build up around patient.	Check with local biomedical personnel.
	ECG Filter set to "ST" or "Diagnostic" mode.	Set ECG Filter to "Monitor" mode.
ECG artifact	Electrode interference from auxiliary devices.	Check patient.
	Patient movement.	Check electrode contacts/ reposition electrodes/cable. Check for electrical interferences, replace wires as necessary.
ESU-Resp off	The high frequency electrosurgery unit interference signal is detected.	Wait unit the high frequency electrosurgery unit interference disappears.
ECG lead fault	Connections not tight or properly secured.	Ensure proper connection. (Electrode to Lead, Lead to cable, cable to monitor).
	Electrodes dry or loose.	Re-prep skin and apply fresh, moist electrodes.
	Cable or Lead wires damaged.	Check with continuity tester.
Pacer rejection on	When Pacer Reject is set to **On.**	This is normal operatio. When Pace Reject is set to **Off**, this message disappears.
Low amplitude ECG signal	Gain set too low.	Readjust as required. (Set via the **Waveforms** tab).
	Electrodes dry/old.	Apply fresh, moist electrodes.
	Skin improperly prepared.	Abrade skin.
	This could be the patient's normal QRS complex.	Verify with a 12-Lead electro-cardiagram.
	Electrodes could be positioned over a bone or muscle mass.	Move ECG patches closer towards each other.

2.7.2 Temperature Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Dashes "--" display in place of numerics	The measurement is invalid.	Check the patient.
Temperature probes not Working	Poor probe contact with body.	Check the body surface contact at the probe tip. Reposition or apply thermoconductive gel.
Temperature not displayed in tile	Improper display setup.	Check **Display Setup** and change as needed.
	Cable not plugged in.	Check the cable.

2.7.3 Resp Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Do not see Resp parameter titles in display	Parameter not configured to display.	Refer to "Display Options Dialog" on page 3-2 of **V 12/V 21** Operating Instructions for additional information.
Resp waveform too large	Scales set inappropriately.	Change Lead selection. Change Respiration scale.
Resp waveform too small	Patient breathing is shallow or patient is turned on side.	Change Lead selection.
	Scale set inappropriately.	Change respiration scale.
False apnea Alarm	Apnea delay may be improperly set.	Choose another apnea delay
	Patient may be having frequent episodes of CVA.	Reposition electrodes to better detect respirations.
	Scale size may be too low.	Change Respiration scale
No Resp waveform or rate displayed	Respiration turned Off.	Turn Resp on.
	Patient connected using ESIS choke cable.	Check that proper patient cable is used. Use non ESIS patient cable.
	Cable not connected	Check cable.
"High Impedance-Check Leads" message	Connections not tight and/or properly secured.	Ensure proper connection (Electrode to Lead, Lead to cable, cable to monitor).
	Electrodes dry or loose.	Re-prep skin and apply fresh, moist electrodes.
	Cable or Lead wires damaged.	Check with continuity tester.Check that proper patient cable is used.
	Patient connected using ESIS choke cable.	Use Mindray non-ESIS patient cable.

MESSAGE/PROBLEM	REASON	SOLUTION
"CVA" message	Can be caused by shallow breathing or an apnea event.	Check the patient.
	Patient HR and respiratory rate identical.	Adjust scales or Leads if necessary. Check the patient.

2.7.4 IBP Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Damped invasive waveform	Air bubbles in tubing.	Eliminate air from tubing.
	Kinked catheter.	Change position of catheter, check patient.
	Catheter against wall of blood vessel.	Check for leaks at connector, flush catheter.
	Blood in tubing.	Pump pressure bag up to 300 mmHg.
	Catheter partially occluded with clot.	Consult physician.
IBP not displayed / No IBP waveform	Improper setup.	Check display setup in monitor setup.
	Cable not plugged in.	Check cable.
	Transducer not connected.	Check transducer connection.
	Stopcock turned improperly.	Check transducer.
	Transducer not zeroed.	Check and zero the transducer.
Dashes "--" display in place of numerics	The measured result is invalid or out of range. IBP might be set to non-pulsatile labels like CVP, LA, RA, and ICP.	Change to a pulsatile label.
Abnormally high or low readings	Transducer too HIGH or to LOW.	Check patient adjust transducer rezero.
Sensor off	The IBP sensor disconnected from the patient or the monitor.	Reconnect sensor, re-zero IBP channel.
Unable to zero	Sensor off and can not zero IBP channel.	Reconnect sensor, re-zero IBP channel.
	Input the pulsatile pressure, can not zero IBP channel.	Input the static pressure, rezero IBP channel.
	The pressure is overange, can not zero IBP channel.	Check the static pressure value, re-zero IBP channel.
	Stopcock not open to atmosphere.	Check transducer.
PAWP button disabled	One IBP channel must be labeled PA.	Label an IBP channel as PA.

2.7.5 NIBP Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Dashes "--" display in place of numerics	Measurement is invalid.	Check sensor placement, move as necessary. Switch limb/ notify physician.
Double beep tone heard	An NIBP Start button is selected when an NIBP measurement is in currently in progress.	Complete the current measurement before selecting the NIBP Start button.
	The NIBP cuff is still deflating when the NIBP Start button is selected.	Wait for the cuff to default before selecting the NIBP Start button.
Unable to obtain a BP	Patient movement.	Wait until a patient is calm or gently hold limb.
	Cuff or hose NOT attached/leaking	Check all connections.
	HR irregular/arrhythmia present.	Check patient and notify physician.
	Blood pressure is out of range.	Check patient and verify BP with manual method.
	Improper cuff size/brand.	Measure patient limb. Use only properly sized approved accessories.
Reading too high or too low	Incorrect cuff size.	Measure patient limb, use correct cuff.
	Patient movement.	Wait until patient is calm or gently hold limb.
NIBP: pneumatic leak	Leakage in pneumatic check. Air leakage is found in hose.	Change the cuff.
NIBP: unable to measure	Unable to make measurement after three automatic retries.	Check patient. Retry measurement. If message reappears, contact Mindray technical support.
NIBP: cuff overpressure	The hardware overpressure limit has exceeded overpressure. The cuff pressure exceeds 297 mmHg in ADU mode, 240 mmHg in PED mode or 147 mmHg in NEO mode.	Power cycle unit. If message reappears, contact Mindray Technical Support.
NIBP retry pump higher	A measurement has been attempted but no reading was possible. This results from inadequate cuff inflation pressure.	Retry will be attempted. Check that appropriate patient size is set. Preset initial inflation pressure.

MESSAGE/PROBLEM	REASON	SOLUTION
NIBP retry	Cuff is loosely wrapped. The cuff may be too loosely wrapped or not attached at all.	Retry will be attempted. Check for leaksand quality of peripheral pulses. Decrease patient movement. Switch cuff to another limb.
	Weak signal: The pulse of the patient may be too weak or the cuff is loosely wrappped.	
	Excessive motion in measurement. Signals contain motion artifact or too much interference.	
	Timeout: Measurement takes more than 120 seconds in ADU/PED mode and 90 seconds in NEO mode.	
	Retry. Overpressure or bad measurement.	

2.7.6 SpO_2 Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Dashes "--" display in place of numerics	Measurement is invalid.	Check sensor placement, move as necessary. Switch limb/notify physician.
Do not see SpO_2 parameter titles in display	Parameters not configured to display.	Refer to "Display Options Dialog" on page 3-2 of **V 12/V 21** Operating Instructions for additional information.
SpO_2: no sensor	Sensor is not plugged in to the monitor.	Plug the sensor into the monitor.
SpO_2: sensor off	Sensor may not be connected to the patient.	Check patient connection.
SpO_2:interference (Masimo/Nellcor only)	Noise detected on the pulse signal prevents pulse discrimination.	Decrease patient motion, check sensor.
SpO_2: pulse search	Hardware settings are being adjusted in order to discriminate a pulse waveform.	Change to site where pulse is stronger if patient is vasoconstricted. Change or readjust sensor if loose.
SpO_2: no pulse (Nellcor Only)	No detectable pulse is measured	Check to patient connection and patient status.
SpO_2: failure	The system has detected an unrecoverable failure of the SpO_2 system.	Power cycle the unit. If the message reappears, contact Customer Support.
Low amplitude SpO_2 signal	SpO_2 sensor on same limb as cuff.	Check sensor placement, move as necessary.
	Patient has poor perfusion.	Switch limb/notify physician.
SpO_2: too much light (Masimo only)	There is too much ambient room light for the sensor to function properly	Minimize the room light around the patient. Check sensor.
SpO_2: unrecognized sensor (Masimo SET only)	The sensor is not recognized by the Monitor.	Replace the sensor with a recommended sensor.
SpO_2: board fault	Masimo SET board failed to operate properly.	See Proper Service Menu: Suggestion.

MESSAGE/PROBLEM	REASON	SOLUTION
SpO_2: sensor fault	Defective Sensor.	Replace sensor.
SpO_2: motion (Nellcor only)	Motion is detected.	Decrease patient motion, check sensor.
SpO_2: check sensor (Nellcor only)	The SpO_2 module has sensed a poor connection or a bad sensor.	Reconnect the same sensor. If the problem persists, replace sensor.
SpO_2 weak signal (Nellcor only)	The SpO_2 signal is too low or too weak.	Check sensor placement, move as necessary. Switch limb/Notify physican.
Unable to obtain SpO_2 reading	Patient has poor perfusion.	Switch limbs / notify physician.
	Sensor not on patient.	Reapply sensor.
	Cables loose / not connected.	Check connections, switch cable.
	Ambient light.	Switch limbs and cover sensor with opaque material.
No SpO2 waveform	Waveform not selected to display.	Go to the **Display Setup Menu**, choose to display **Pleth** in the waveform area.
	Cable or sensor not plugged in.	Check cable and sensor.

2.7.7 Power Supply Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Different battery voltages	Battery failure.	Replace battery.
	Cable defective or poorly connected.	Check that the cable between battery interface board and power module is correctly connected. Check that cables and connectors are not damaged.
	Power board failure.	Replace the power board.
Battery capacity too low	Battery failure.	Power board failure
	Cable defective or poorly connected.	Check that the cable is correctly connected. Check that connecting cables and connectors are not damaged.
	Power board failure.	Replace the power board.
Battery cannot be recharged	Battery failure.	Power board failure and recharge the replacement battery. If the replacement battery can be recharged, the original one fails.
	Cable defective or poorly connected.	Check that cable between battery interface board and power module is correctly connected. Check that cables and connectors are not damaged.
	Power board failure.	Replace the power board.
No +3.3V output	Power supply protection.	Turn off the monitor then restart it.

MESSAGE/PROBLEM	REASON	SOLUTION
No +5.0V output	Power board failure.	If the problem remains, disconnect the AC mains for 5s and reconnect it, then restart the patient monitor. If the problem still remains, replace the power board.
No +5.0V CIS output		
No +12V output		

NOTE: **When the power module has a failure, it may cause problems to other components, e.g. the monitor suddenly breaks down during start-up, as the power module may have a power supply protection. In this case, troubleshoot the power module per the procedure described in the table above.**

NOTE: **Components of the main unit, V Hub and parameter modules are powered by the power module. In the event that a component malfunctions, check if the operating voltage is correct. Refer to Theory of Operation for the operating voltage and measurement points of each component.**

2.7.8 Power On/Off Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
The patient monitor fails to start. AC LED or battery LED does not light.	AC mains not connected or battery too low.	Check that AC mains is properly connected or battery capacity is sufficient.
	Power supply protection.	Refer to Power Supply Failures.
	Cables defective or poorly connected.	Check the cables from power switch and LED cable to front interface board, front interface board to main board. Check that cables and connectors are not damaged.
	Power switch and LED cable defective.	Replace the power switch and LED cable.
	Power module defective.	Replace the power module.
	Carrier board defective.	Replace the carrier board.

2.7.9 Display Failure Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Integrated display is blank out but the patient monitor still works correctly.	Cables defective or poorly connected.	Check that cables from the display to the carrier board and from the backlight board to the front interface board/display are correctly connected. Check that the cables and connectors are not damaged.
	Backlight board defective.	Replace the backlight board.
	Power module defective.	Replace the power module.
	Display defective.	Replace the display.
Secondary display does not function.	Cables defective or poorly connected.	Check that the cable between the display and the patient monitor is correctly connected. Check that the cables and connectors are not damaged.
	DVI interface board defective.	Replace the DVI interface board.
Secondary display displays snows or flashing specks.	Cables defective or poorly connected.	Check that the cable between the display and the patient monitor is correctly connected. Check that the cables and connectors are not damaged.
	DVI interface board defective.	Replace the DVI interface board.
	The carrier board is damaged.	Replace the carrier board.
Images overlapped or distorted	Cables defective or poorly connected.	Check that the cable between the display and the carrier board is correctly connected. Check that the cables and connectors are not damaged.
Touchscreen does not respond.	Touchscreen disabled.	Check that the cables from the touchscreen to the touchscreen control board, the touchscreen control board to the front interface board, and the front interface board to the carrier board are correctly connected.
	Cables defective or poorly connected.	Check that the cables and connectors are properly connected.
	Touchscreen control board defective.	Replace the touchscreen control board.
	Touchscreen defective.	Replace the touchscreen.
	Carrier board defective.	Replace the carrier board.
Touch position invalid	Touchscreen not calibrated.	Calibrate the touchscreen.

2.7.10 V Hub Failure Troubleshooting

2.7.10.1 V Hub - External V Hub Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
SMR cannot identify parameter modules.	Extension cable defective or poorly connected.	Check that the cable between SMR and main unit is properly connected. Check that the connecting cables and connectors are not damaged. Check that contact screws on V Hub are tightly screwed and properly contact the V Hub.
	Defective parameter module.	Replace the suspicious parameter module with a known good module. Check if the patient monitor identifies the replacement module. If yes, it means that the original one is defective.
	Wrong communication board software revision.	Upgrade the program of the module or V Hub.
	Module (in some slots) unrecognized.	Replace the Nios II module. Replace the 6-slot V Hub communication board.
	Power supply failure.	Check if the voltage between two contact screws in any slot reaches 12VDC. If yes and the parameter module functions, the PCB assembly in SRM might fail. If there is no 12V sent to the V Hub, check that the power module output voltage to the USB interface board reaches 12V. If yes, the fuse on the USB interface board might blow. Replace the USB interface board.
	Cable defective or poorly connected.	Check that cable between SMR interface board and communication board is properly connected. Check that connecting cables and connectors are not damaged.
	Nois II module loose or failure.	Check that Nois II module is correctly plugged. If the symptom persists, replace the Nois II module.
	V Hub interface board failure.	Replace the V Hub interface board.
	V Hub communication board failure.	Replace the V Hub communication board.
	USB interface board failure.	Replace the USB interface board.
	Carrier board failure.	Replace the carrier board.

2.7.10.2 Integral V Hub Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Integral V Hub cannot identify parameter modules.	Module failure.	Replace the parameter module. If a new module is identified, the original one is defective. Check that the cables from 3-slot V Hub communication board to VPS module rack communication board, module rack to carrier board are properly connected. Replace the Nios II module.
	Cable defective or poorly connected.	Check that connecting cables and connectors are not damaged.
	Wrong communication board software revision.	Upgrade the program of the module or integral V Hub
	Module (in some slots) unrecognized.	Replace the 6-slot V Hub communication board.
	Power supply to integral V Hub abnormal.	Check if the voltage between two contact screws in any slot reaches 12VDC. If yes and the parameter module functions, the PCB assembly in SRM might fail. If there is no 12V sent to the V Hub, check that the power module output voltage to the USB interface board reaches 12V. If yes, the fuse on the USB interface board might blow. Replace the USB interface board.
	3-slot or VPS module rack communication board failure.	Replace the 3-slot or VPS module rack communication board.
	Nois II module failure.	Replace the Nois II module.
	Carrier board failure.	Replace the carrier board.

2.7.11 Alarm Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
The alarm lamp is not lit or extinguished but alarm sound is issued.	Cable defective or poorly connected.	Check that cables from alarm LED board to the front interface board and the front interface board to carrier board are properly connected. Check that connecting cables and connectors are not damaged.
	Alarm LED board failure.	Replace the alarm LED board.
	Carrier board failure.	Replace the carrier board.
No alarm sound is issued but alarm lamp is lit.	Audio alarm disabled.	N/A
	Cable defective or poorly connected.	Check that the cable between speaker and carrier board is properly connected. Check that connecting cables and connectors are not damaged.
	FPGA audio logic error.	Upgrade the audio logic part of the FPGA program.
	Speaker failure.	Replace the speaker.
	Carrier board failure.	Replace the carrier board.

2.7.12 Recorder Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
No printout	Recorder module disabled.	Check if the recorder status LED lights. Otherwise, check for other possible causes.
	Paper reversed.	Re-install the paper roll
	Cable defective or poorly connected	Check that cable between recorder and carrier board is properly connected. Check that connecting cables and connectors are not damaged.
	Recorder power supply failure.	Check if the power module outputs 5 V DC and 12V DC correctly
	Recorder failure.	Replace the recorder
Poor print quality or paper not feeding properly	Paper roll not properly installed.	Stop the recorder and re-install the paper roll
	Print head dirty.	1. Check the thermal print head and the paper roller for foreign matter. 2. Clean the thermal print head with an appropriate clean solution
	Recorder failure.	Replace recorder.

2.7.13 Interface Failure Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
No analog signals or nurse call signals are issued.	Respective output disabled.	N/A
	DVI interface board cable loose.	Check that cable between DVI interface board and carrier board is properly connected. Check that connecting cables and connectors are not damaged.
	DVI interface board failure.	Replace the DVI interface board.
	Carrier board failure.	Replace the carrier board.
Device with USB port does not function. (Assume that the peripheral devices are good.)	Cable defective or poorly connected.	Check that cable between USB interface board and carrier board is properly connected. Check that connecting cables and connectors are not damaged.
	USB interface board failure.	Replace the USB interface board.
	Carrier board failure.	Replace the carrier board.

2.7.14 USB Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
USB stick malfunction	Wrong USB stick or small memory space.	Use only SanDisk-manufactured USB storage cards. Those with 1GB memory space are recommended.
	Cable defective or poorly connected.	Check that cable between USB board and carrier board is properly connected. Check that connecting cables and connectors are not damaged.

2.7.15 Network-Related Problem Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
No connection to LAN	N/A	Check that the cables and connectors are in good condition and that the network is correctly connected. Check that the hub or switch is correctly configured.
DVI interface board failure	N/A	Replace DVI interface board
Incorrect LAN cable connection	N/A	Check LAN cable connection. LAN cable shall not be longer than 50 m.
Frequent dropouts and network disconnects	Incorrect IP address configuration.	Check for IP address conflict. Reconfigure IP address.
Incorrect LAN cable connection	N/A	Check LAN cable connection. LAN cable shall not be longer than 50m
Excessive requests for viewing the patient monitor at the same time	N/A	A patient monitor can only be viewed by 4 other patient monitors at the same time under the View Others mode. The excessive view requests system will be ignored.
Incorrect IP configuration	N/A	Check for IP address conflict. Reconfigure IP address.
The patient monitor is connected to a LAN but cannot view other patients under the View Others mode.	CIS assembly failure.	Replace CIS assembly.

2.7.16 Software Upgrade Troubleshooting

MESSAGE/PROBLEM	REASON	SOLUTION
Boot file upgrade fails	Power failure or unintended power off during boot file upgrade.	Return the CPU board to factory for repair.
Incorrect network connection	N/A	Check that network connector, not CIS connector on the patient monitor is used. Ensure that the V Hub or switch runs normally. Check that net twines are of the right type and have been connected correctly.
Wrong upgrade package has been downloaded	Upgrade package must be a .pkg file.	Select package according to system requirement.
Program upgrade fails.	N/A	Recommend not to upgrade a program when the patient monitor is connected to a network with multiple PCs.
Incorrect IP address configuration	IP address conflict.	Configure a fixed IP address in range as specified for the patient monitor.

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3.0 *Block Diagrams*

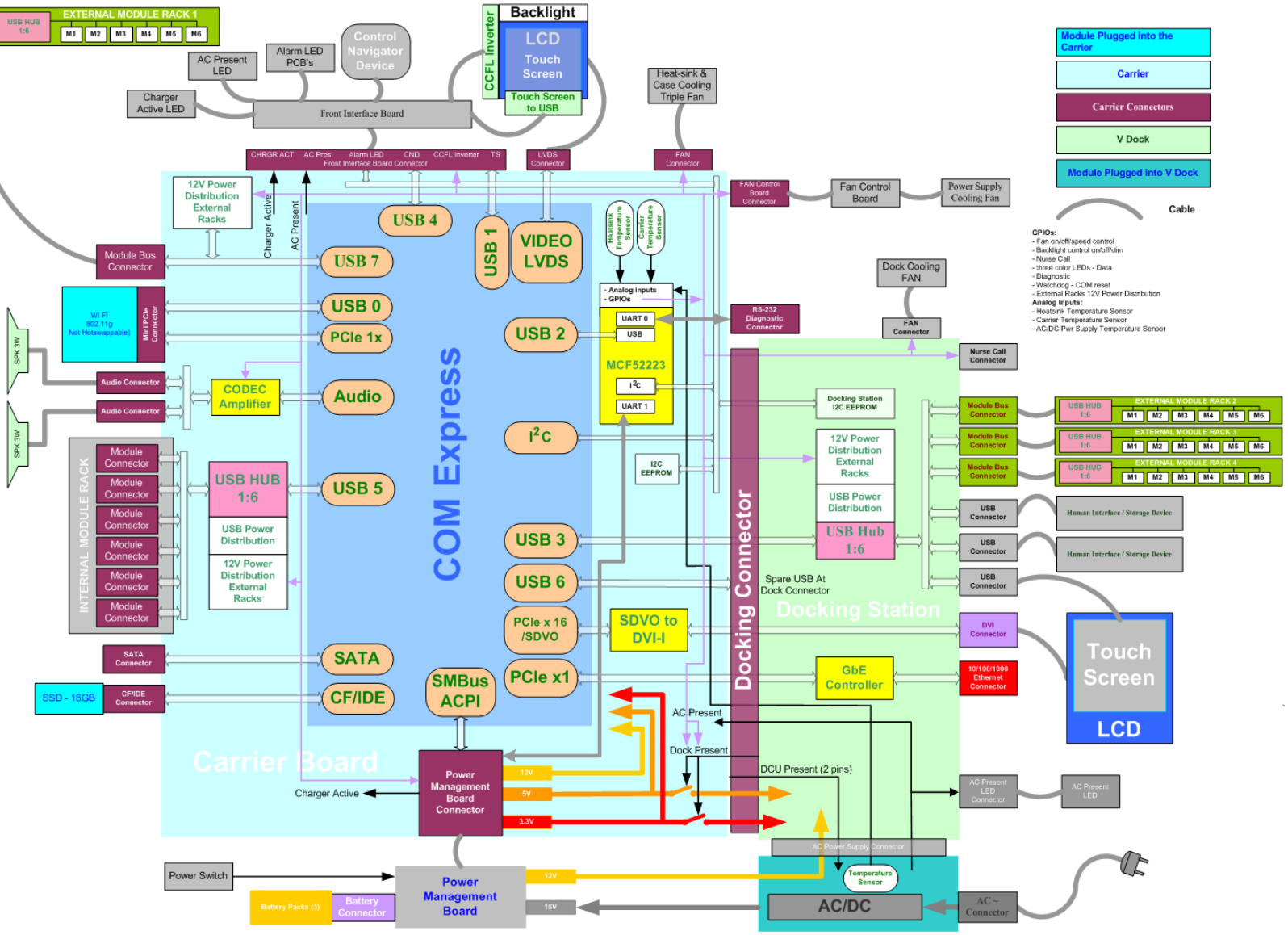
3.1 Introduction

The block diagrams indicate the internal organization of the instrument. The block diagrams are used to gain both familiarity with the instrument and locate malfunctioning boards as readily as possible.

DESCRIPTION	PART NUMBER
CPU Module	0671-00-0093-02
1GB DDR2 667MHZ	801-DA6K-00011-00
Front Interface Board	801-DA6K-00004-00
Alarm LED Board (**V 12**)	801-DA6K-00003-00
Alarm LED Board (**V 21**)	801-DA6K-00017-00
Inverter Board	801-DA6K-00005-00
Monitor Carrier Board	801-DA6K-00008-00
Power Management Board	801-DA6K-00038-00
Docking Station Board	801-DA6K-00033-00
AC-DC Module Board	801-DA6K-00032-00
V Hub Board	801-DA6K-00029-00

NOTE: **See Isometric Drawings and Parts List in Chapter 4 for a complete list of Part Numbers.**

3.2 Block Diagram

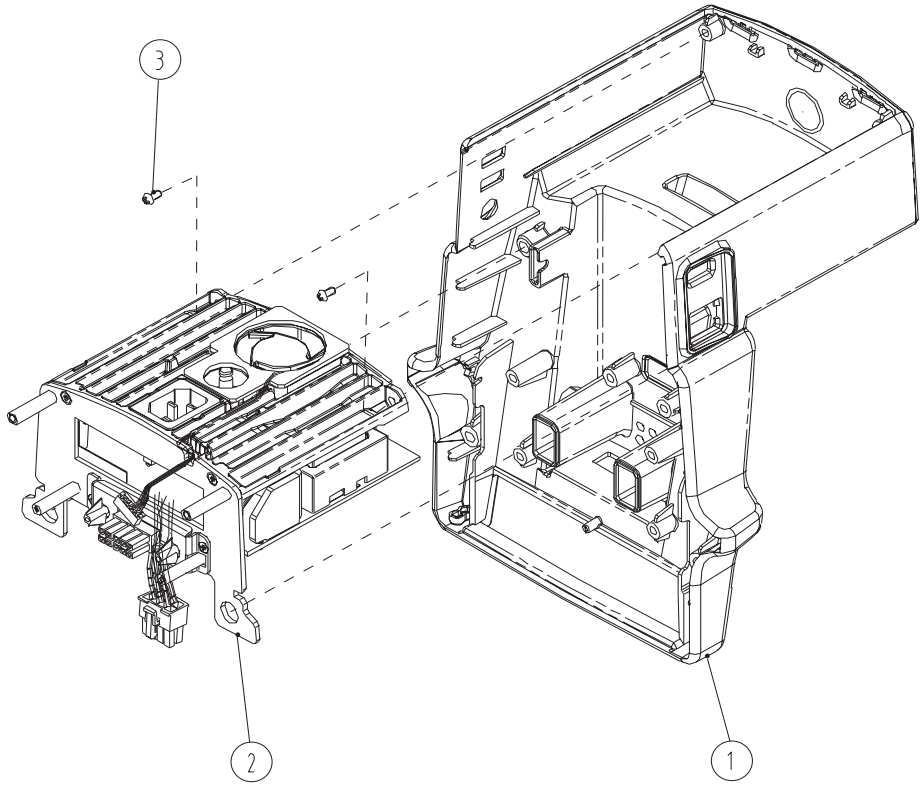


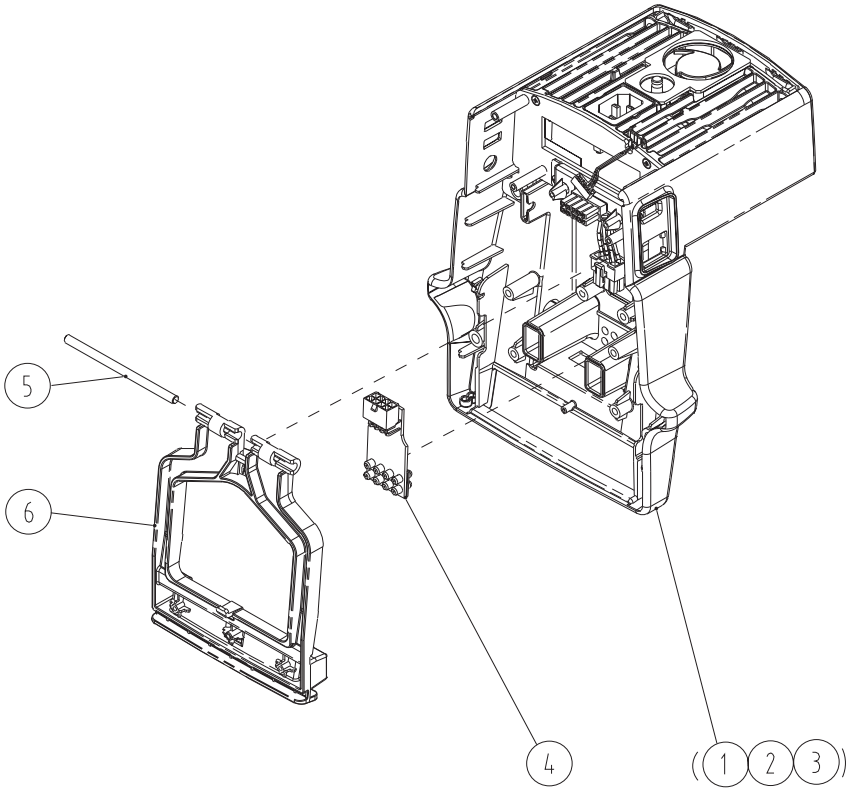
4.0 *Isometric Drawings and Parts List*

4.1 Introduction

This chapter provides information necessary to identify the replacement parts and assemblies of instruments.

4.2 V Dock Assembly (P/N 0998-00-1801-01)

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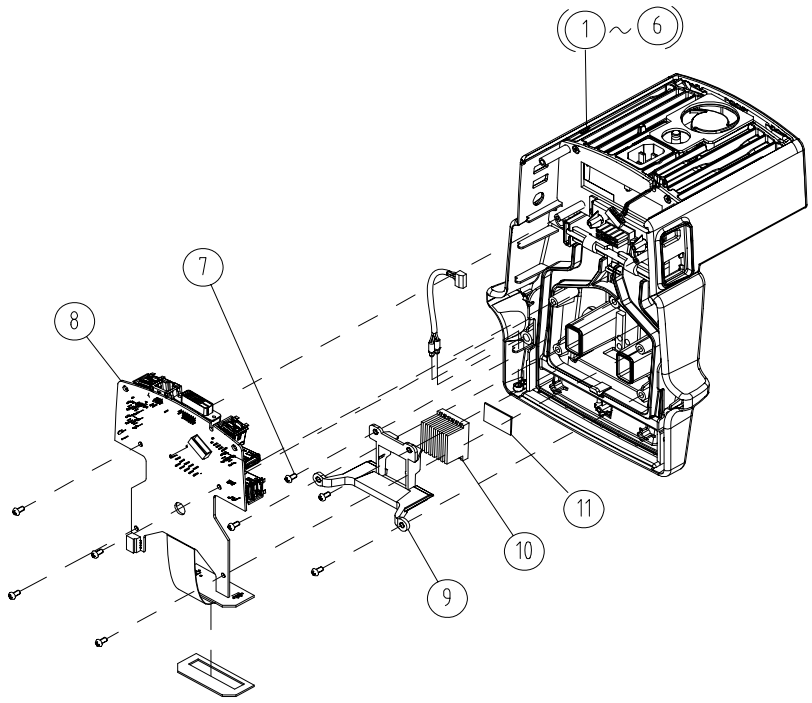
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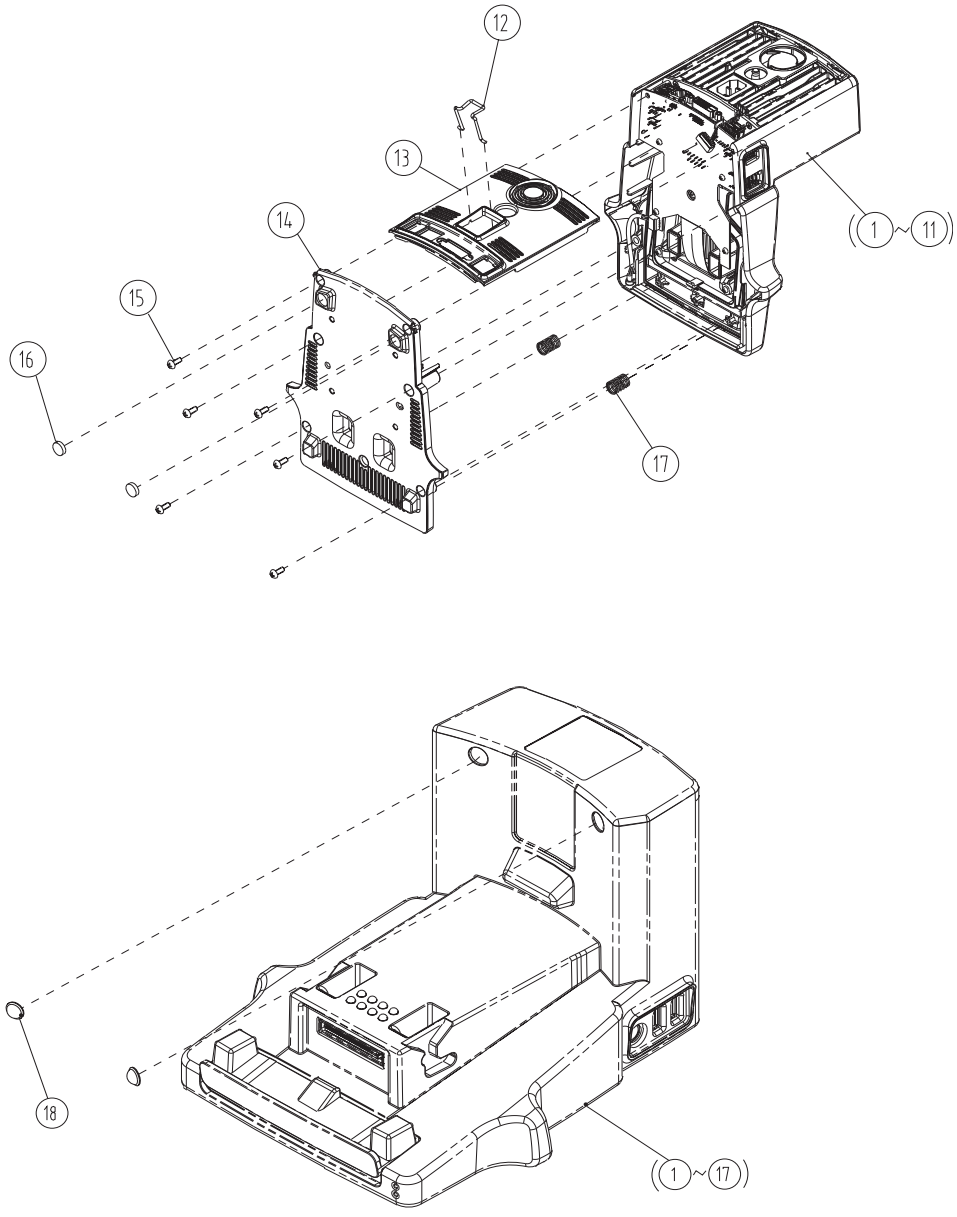
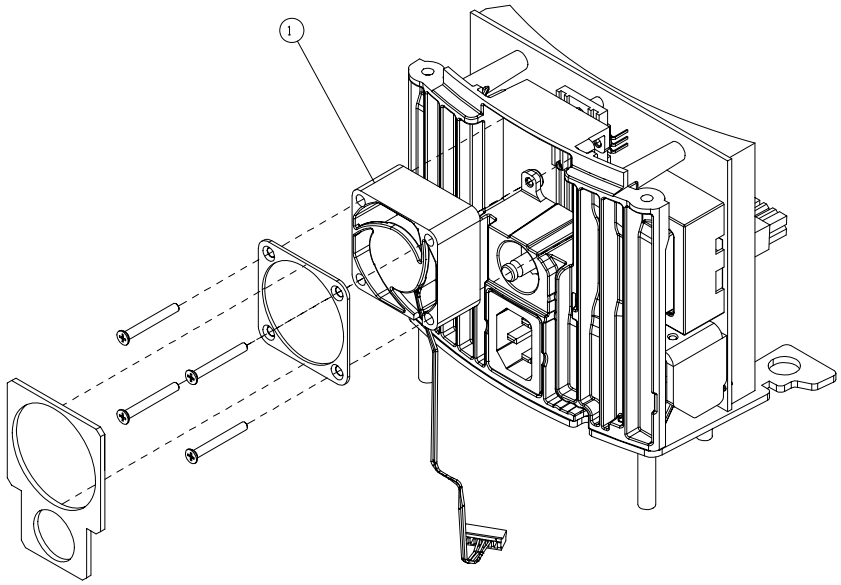


ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, DOCKING STATION	0998-00-1801-01
1	TOP HOUSING SERVICE KIT, DOCK	801-DA6K-00030-00
2	AC-DC POWER PCBA SERVICE KIT, DOCK	801-DA6K-00032-00
3, 7, 15	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
4	POWER PIN BOARD SERVICE KIT, DOCK	801-DA6K-00031-00
5	SHAFT, DOCKING STATION	0226-04-0652
6	LATCH, DOCKING STATION	0380-00-0577-01

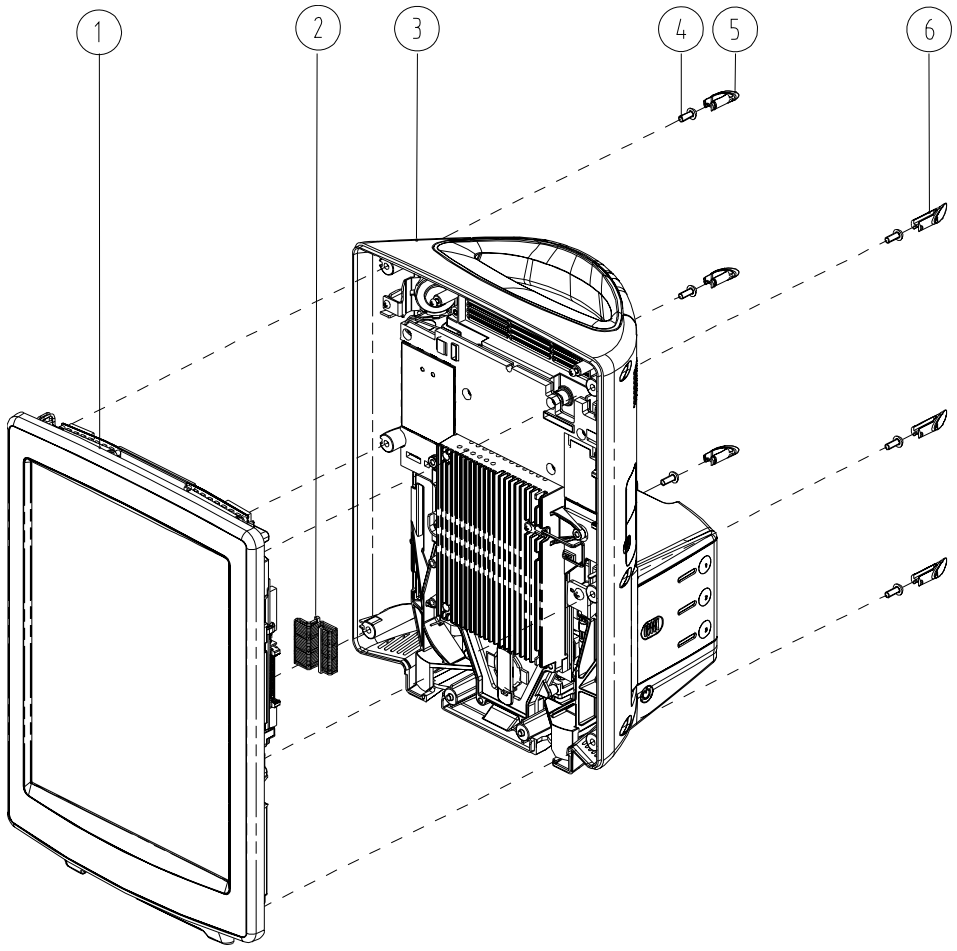
ITEM NO.	DESCRIPTION	PART NUMBER
8	DOCKING STATION PCBA SERVICE KIT	801-DA6K-00033-00
9	BRACKET, SUPPORT, DOCKING STATION	0380-00-0576-01
10	POWER PIN RADIATOR	045-000292-00
11	POWER PIN HEAT CONDUCT GLUE	045-000290-00
12	RETAINER, POWER CORD	0226-00-0046-01
13	COVER, REAR, DOCKING STATION	0380-00-0578-01
14	HOUSING,BOTTOM, DOCKING STATION	0380-00-0579-20
16	FOOT, V SERIERS	0348-00-0223
17	DOCK LATCH SPRING	033-000097-00
18	BUMPER, 9.5MMX3.8MM	034-000117-00

4.2.1 AC-DC Power Module (P/N 801-DA6K-00032-00)



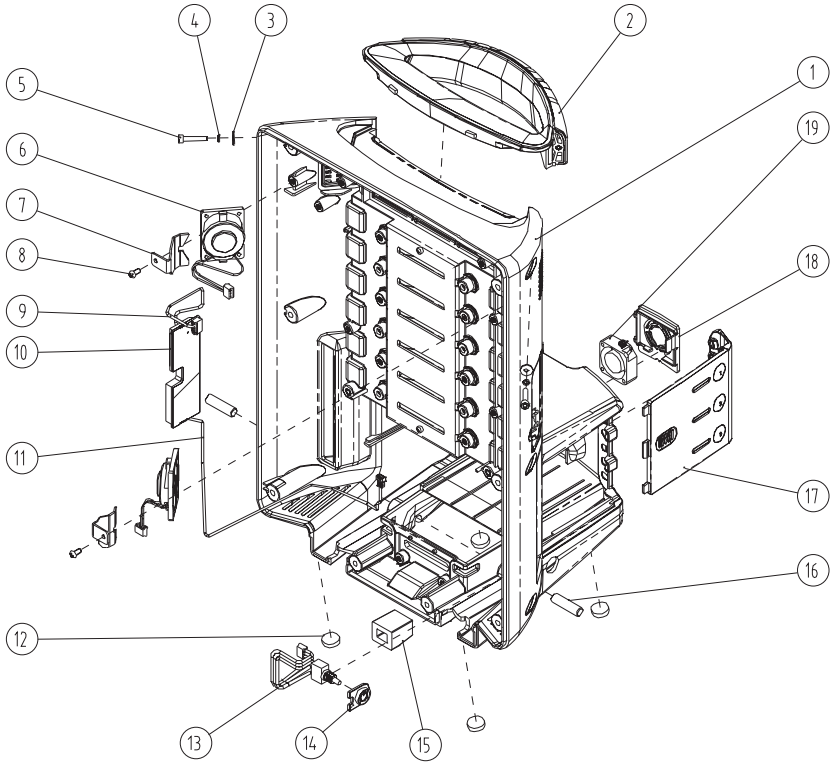
ITEM NO.	DESCRIPTION	PART NUMBER
	AC-DC POWER MODULE	801-DA6K-00032-00
1	FAN SERVICE KIT, DOCK	801-DA6K-00034-00

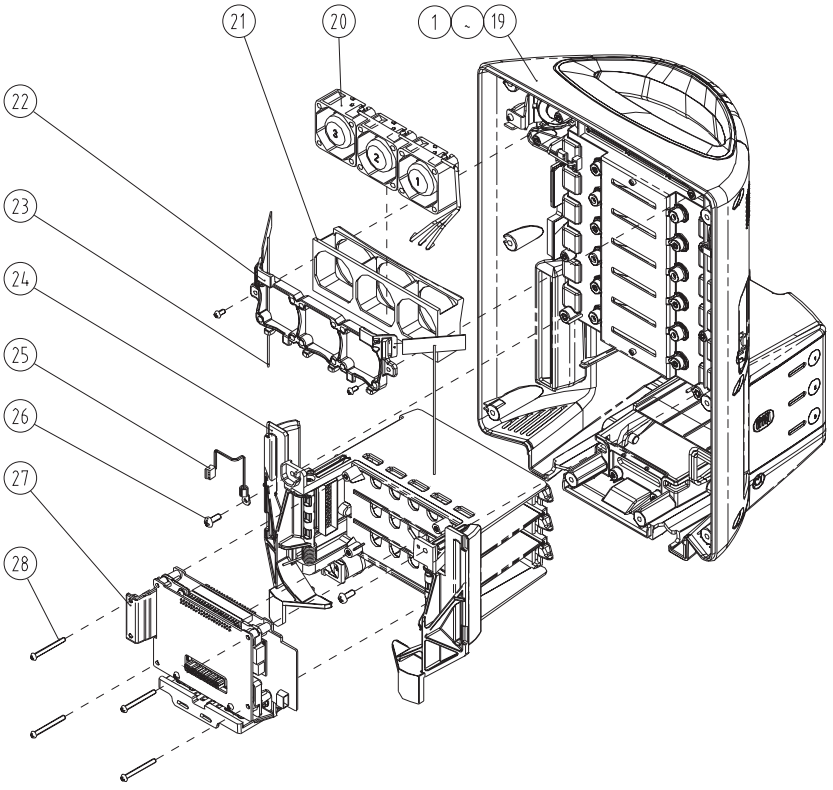
4.3 Subassembly, 12.1" Monitor (P/N 0998-00-1800-101)

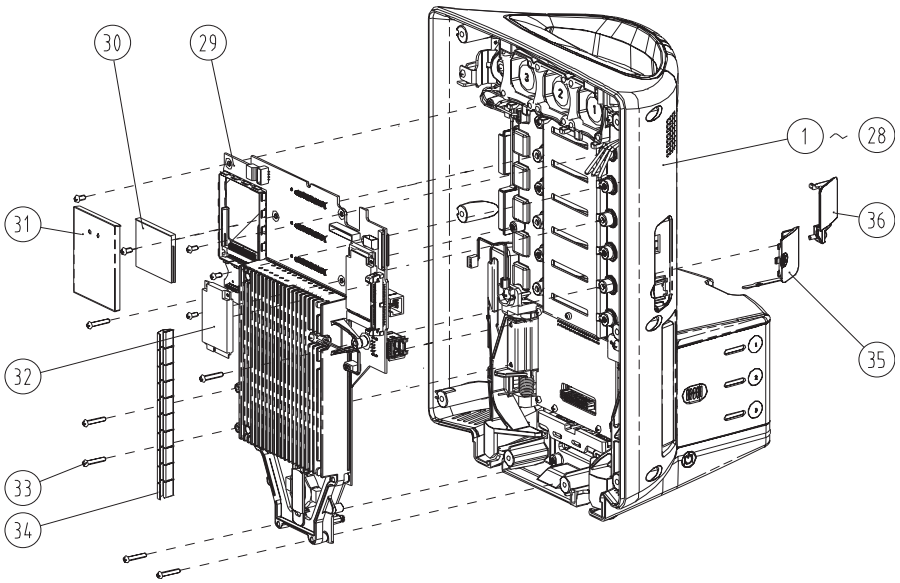


ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, 12.1" MONITOR	0998-00-1800-101
1	SUBASSEMBLY, FRONT, 12.1" MONITOR	801-DA6K-00117-00
2	CABLES SERVICE KIT, 12.1" MONITOR	801-DA6K-00107-00
3	SUBASSEMBLY, BACK, 12.1" MONITOR	0997-00-0607-01
4	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
5,6	SMALL PARTS SERVICE KIT, 12.1" MONITOR	801-DA6K-0011100

4.3.1 Subassembly, Back, 12.1" Monitor (P/N 0997-00-0607-01)

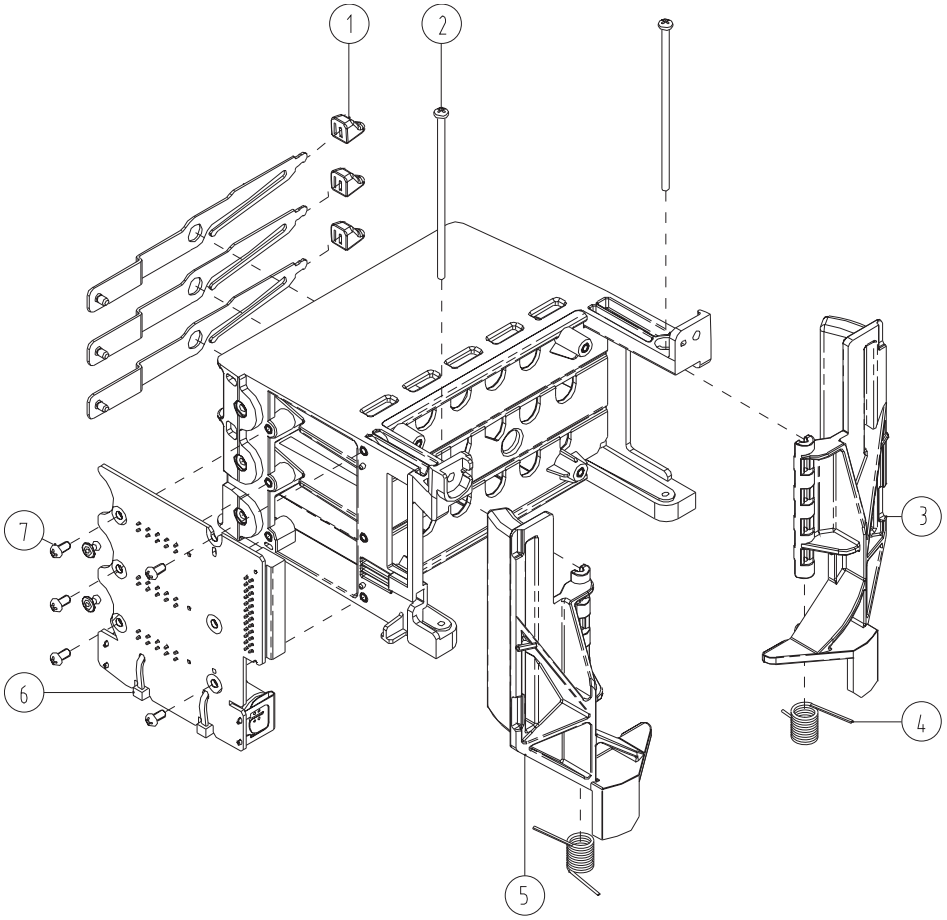






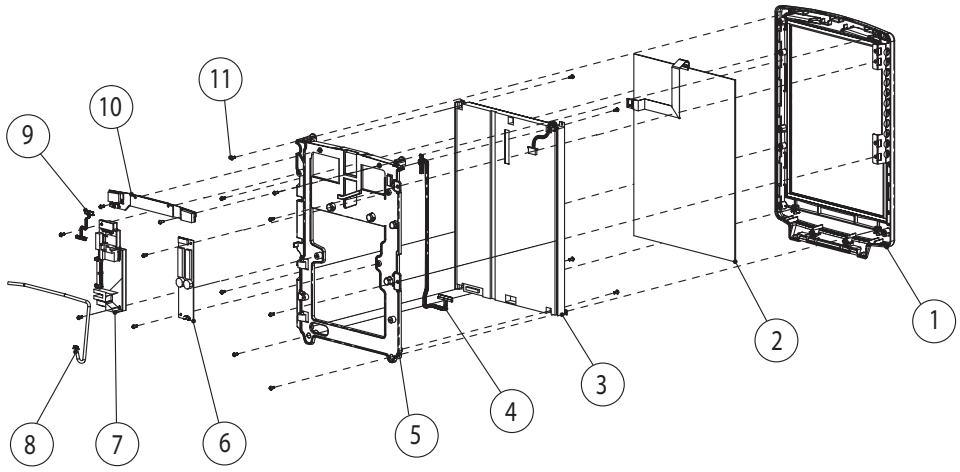
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, BACK, 12.1″ MONITOR	0997-00-0607-01
1	BACK HOUSING SERVICE KIT, 12.1" MONITOR	801-DA6K-00001-00
2, 12, 14, 16,17,18,35, 36	SMALL PARTS SERVICE KIT, 12.1″ MONITOR	801-DA6K-00111-00
3, 4, 5, 8, 26, 28, 33	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	SPEAKER AND CABLE ASSEMBLY SERVICE KIT, MONITOR	801-DA6K-00022-00
7	BRACKET, SPEAKER MOUNTING, 12.1" MONITOR	0406-00-0919-01
9, 11, 23, 25	CABLES SERVICE KIT, 12.1″ MONITOR	801-DA6K-00107-00
10	FAN CONTROL PCBA SERVICE KIT, MONITOR	801-DA6K-00014-00
13	PUSHBUTTON SWITCH AND CABLE ASSEMBLY, MONITOR	801-DA6K-00092-00
15	GASKET, BOTTOM FAN, 12.1" MONITOR	049-000118-00
19	SMALL FAN SERVICE KIT, MONITOR	801-DA6K-00013-00
20	TRIPLE FAN SERVICE KIT, 12.1" MONITOR	801-DA6K-00012-00
21	GASKET, TOP FANS, 12.1" MONITOR	049-000116-00
22	BRACKET, FAN MOUNTING	0380-00-0583-01
24	CHASSIS SUBASSEMBLY SERVICE KIT, 12.1" MONITOR	801-DA6K-00023-00
27	POWER MANAGEMENT SERVICE KIT, MONITOR	801-DA6K-00038-00
29	CARRIER BOARD AND CPU SERVICE KIT, MONITOR	801-DA6K-00008-00
30	CF SOLID STATE DRIVE SERVICE KIT, MONITOR	801-DA6K-00036-00
31	COVER, COMPACT FLASH SHIELD	0337-00-0221-02
32	PRO/WIRELESS SERVICE KIT, MONITOR	801-DA6K-00037-00
34	CLIP, PIECE, GROUNDING	024-000077-00

4.3.2 Subassembly, Chassis, 12.1" Monitor (P/N 801-DA6K-00023-00)



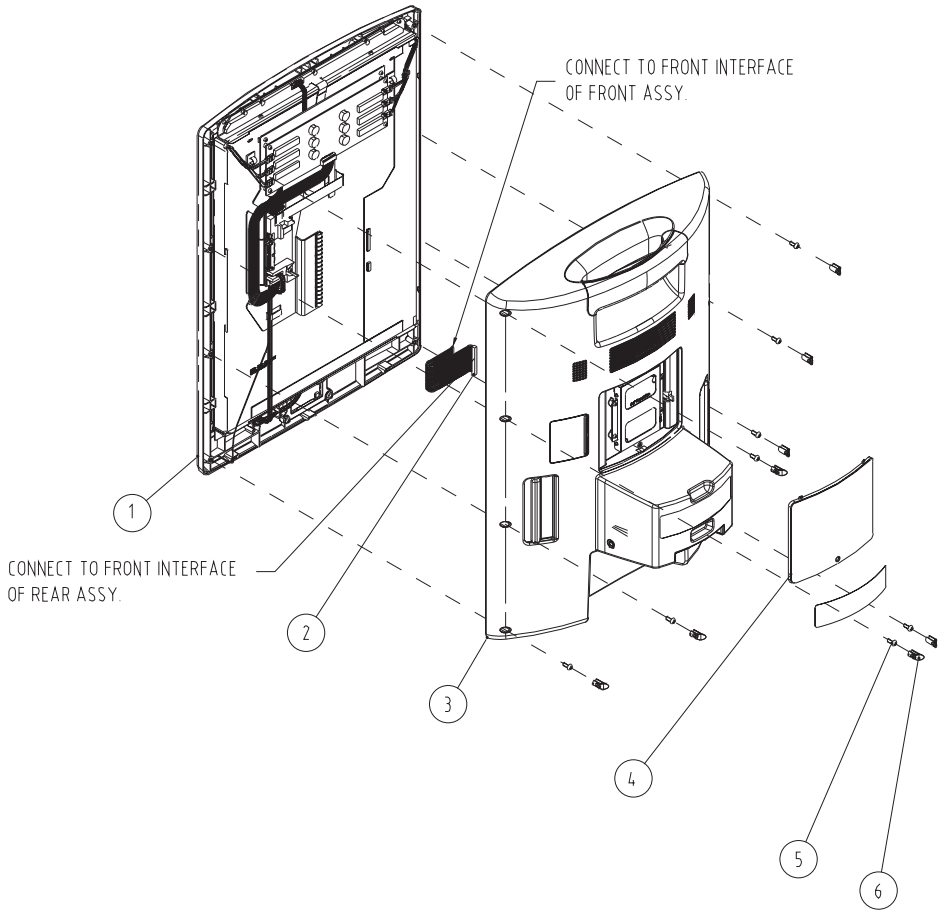
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, CHASSIS, 12.1" MONITOR	801-DA6K-00023-00
1, 2, 3, 4, 5	SMALL PARTS SERVICE KIT, 12.1" MONITOR	801-DA6K-00111-00
6	LI-ION BATTERY PACK SERVICE KIT, MONITOR	801-DA6K-00026-00
7	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00

4.3.3 Subassembly, Front, 12.1" Monitor (P/N 801-DA6K-00117-00)



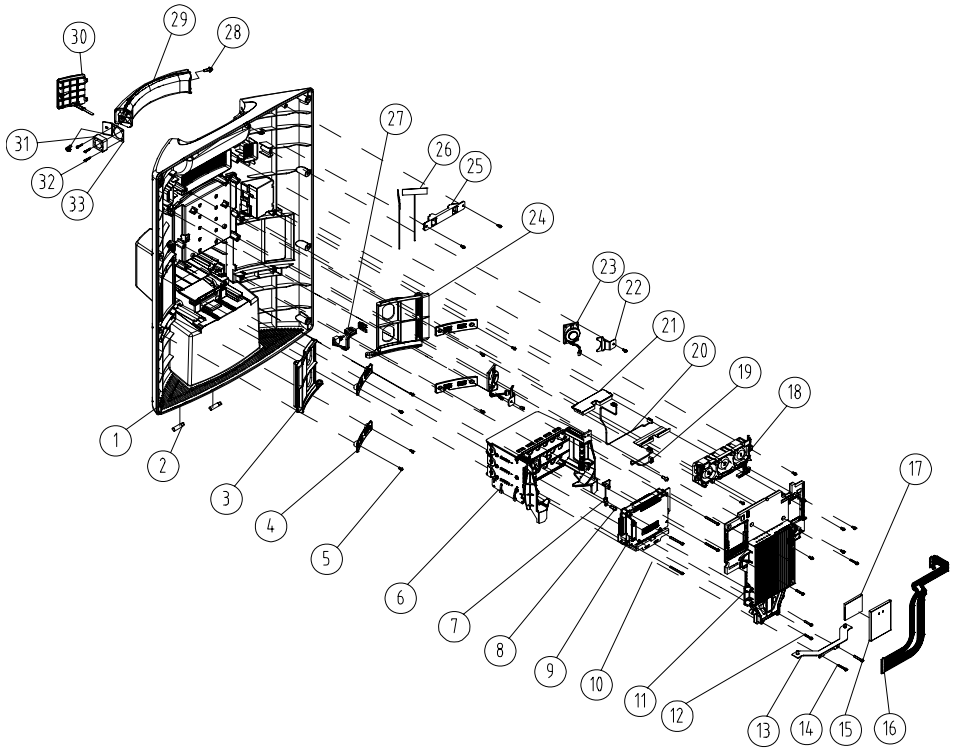
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, FRONT, 12.1" MONITOR	801-DA6K-00117-00
1	FRONT HOUSING SERVICE KIT, 12.1" MONITOR	801-DA6K-00002-00
2	TOUCHSCREEN SERVICE KIT, 12.1" MONITOR	801-DA6K-00006-00
3	NEC LCD SERVICE KIT, 12.1" MONITOR	801-DA6K-00007-00
4, 8, 9	CABLES SERVCIE KIT, 12.1" MONITOR	801-DA6K-00107-00
5	FRAME, DISPLAY MOUNTING, 12.1" MONITOR	0426-00-0096-01
6	CCFL INVERTER PCBA SERVICE KIT, 12.1" MONITOR	801-DA6K-00005-00
7	FRONT INTERFACE PCBA SERVICE KIT, MONITOR	801-DA6K-00004-00
10	ALARM LED PCBA SERVICE KIT, 12.1" MONITOR	801-DA6K-00003-00
11	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00

4.4 Subassembly, 21.3" Monitor (P/N 0998-00-1800-201)



ITEM NO.	DESCRIPTION	PART NUMBER
	21.3" MONITOR	0998-00-1800-201
1	SUBASSEMBLY, FRONT, 21.3" MONITOR	801-DA6K-00118-00
2	CABLES SERVICE KIT, 21.3" MONITOR	801-DA6K-00108-00
3	SUBASSEMBLY, BACK, 21.3" MONITOR	0997-00-0614-01
4	SUB-ASSY COVER, SERVICE, 21.3" MONITOR	115-004971-00
5	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	SMALL PARTS SERVICE KIT, 21.3" MONITOR	801-DA6K-00112-00

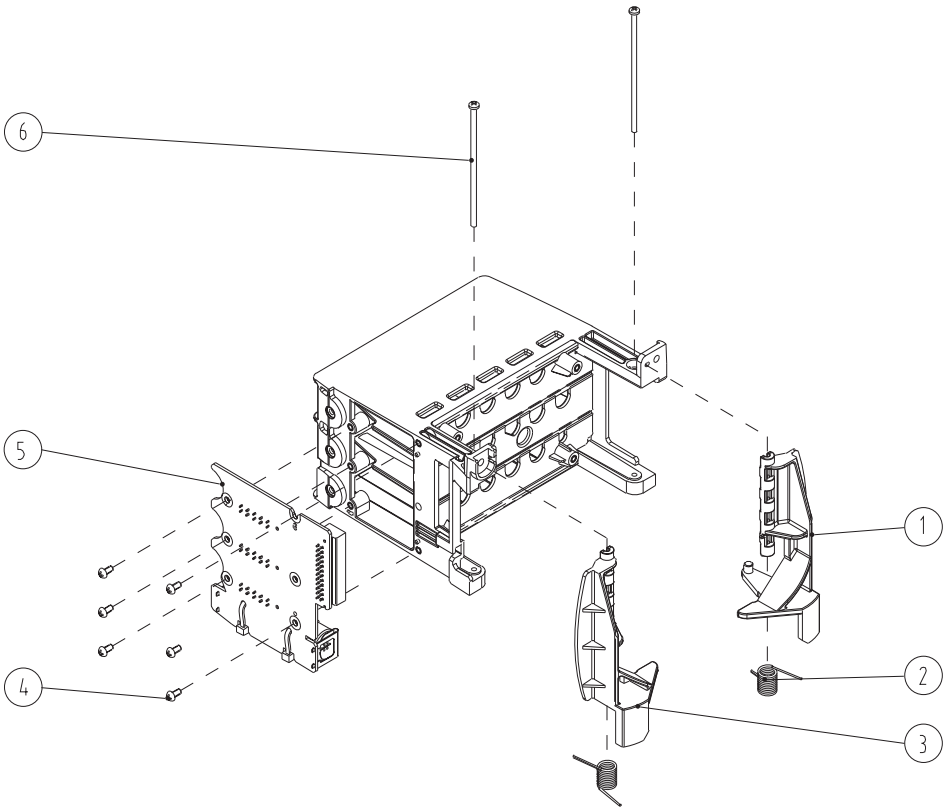
4.4.1 Subassembly, Back, 21.3" Monitor (P/N 0997-00-0614-01)



ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, BACK, 21.3" MONITOR	0997-00-0614-01
1	BACK HOUSING SERVICE KIT, 21.3" MONITOR	801-DA6K-00015-00
2, 3, 24, 25,29, 30	SMALL PARTS SERVICE KIT, 21.3" MONITOR	801-DA6K-00012-00
4	SUPPORT, GRIP, 21.3" MONITOR	0380-00-0595-01
5, 8,10, 12, 14, 28, 32	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	CHASSIS SUBASSEMBLY SERVICE KIT, 21.3" MONITOR	801-DA6K-00024-00
7, 16, 19, 20, 26	CABLES SERVICE KIT, 21.3" MONITOR	801-DA6K-00108-00
9	POWER MANAGEMENT SERVICE KIT, MONITOR	801-DA6K-00038-00
11	CARRIER BOARD AND CPU SERVICE KIT, MONITOR	801-DA6K-00008-00
13	21.3" MONITOR BRACKET SHEET METAL	042-003419-00
15	COVER, COMPACT FLASH SHIELD	0337-00-0221-02
17	CF SOLID STATE DRIVE SERVICE KIT, MONITOR	801-DA6K-00036-00
18	TRIPLE FAN SERVICE KIT, 21.3" MONITOR	801-DA6K-00025-00
21	FAN CONTROL PCBA SERVICE KIT, MONITOR	801-DA6K-00014-00
22	BRACKET, SPEAKER MOUNT, 21.3 MONITOR	0406-00-0919-02
23	SPEAKER AND CABLE ASSEMBLY SERVICE KIT, MONITOR	801-DA6K-00022-00

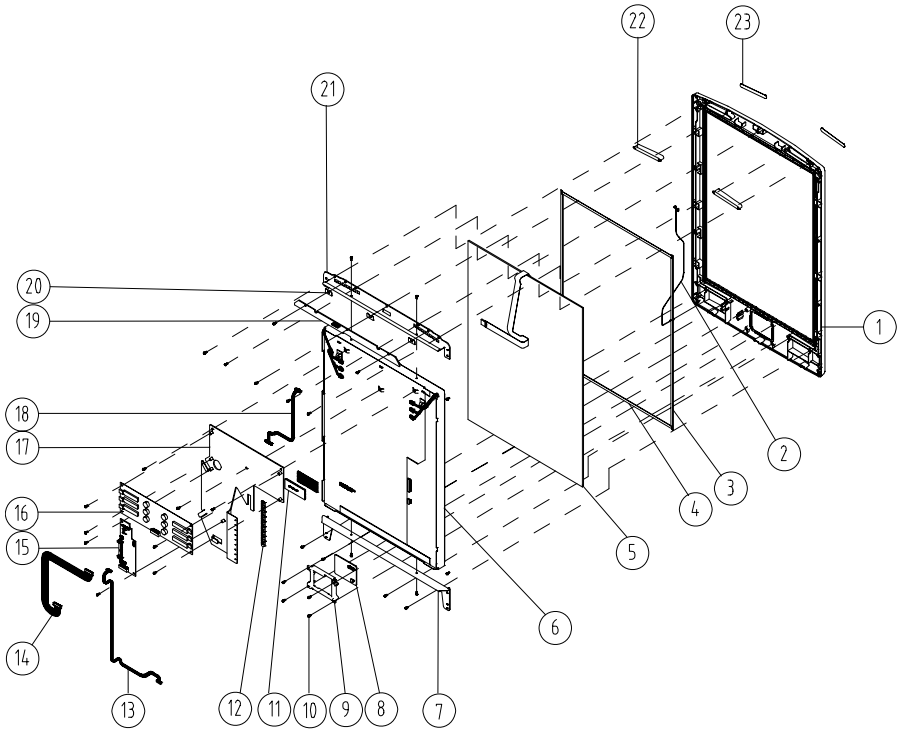
ITEM NO.	DESCRIPTION	PART NUMBER
25	BRACKET, ANTENNA MOUNTING	0380-00-0643-01
27	PUSH BUTTON SWITCH AND CABLE ASSEMBLY, MONITOR	801-DA6K-00092-00
31	SMALL FAN SERVICE KIT, MONITOR	801-DA6K-00013-00
33	BRACKET, FAN MOUNTING	0406-00-0937-01

4.4.2 Subassembly, Chassis, 21.3" Monitor (P/N 801-DA6K-00024-00)



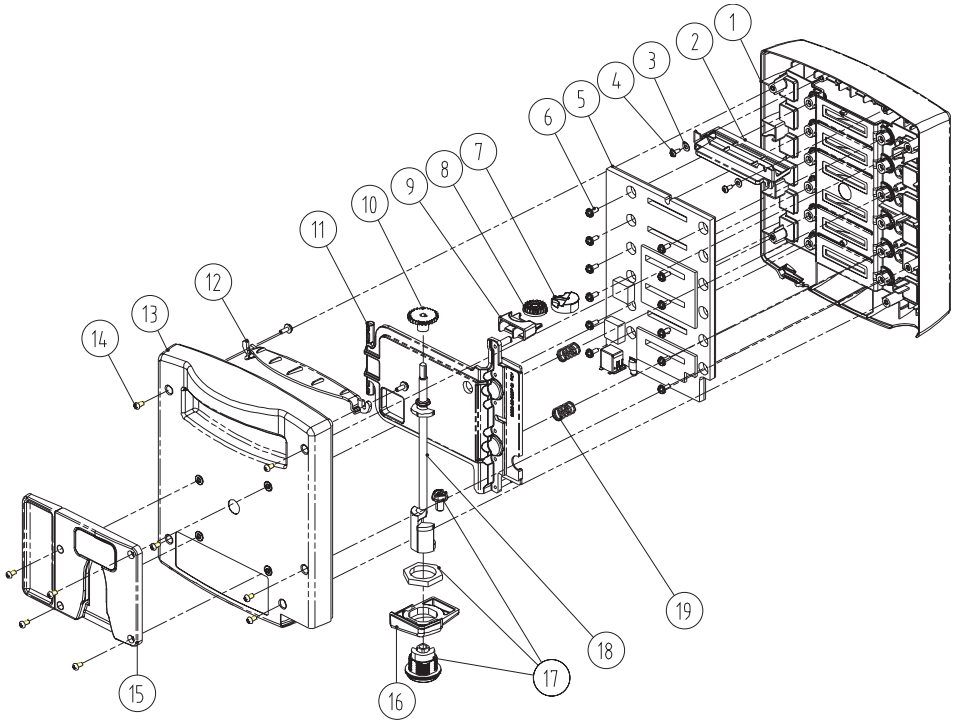
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, CHASSIS, 21.3" MONITOR	801-DA6K-00024-00
1, 2, 3, 6	SMALL PARTS SERVICE KIT, 21.3" MONITOR	801-DA6K-00112-00
4	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
5	LI-ION BATTERY PACK SERVICE KIT, MONITOR	801-DA6K-00026-00

4.4.3 Subassembly, Front, 21.3" Monitor (P/N 801-DA6K-00118-00)



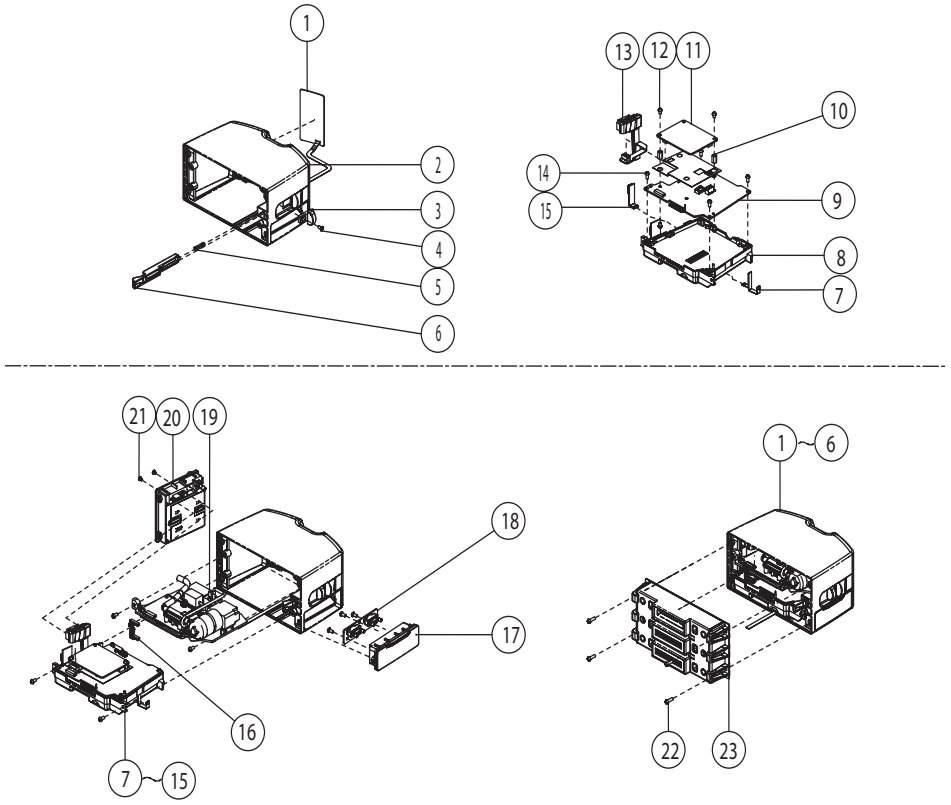
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, FRONT, 21.3" MONITOR	801-DA6K-00118-00
1	FRONG HOUSING SERVICE KIT, 21.3" MONITOR	801-DA6K-00016-00
3,4, 5	TOUCHSCREEN SERVICE KIT, 21.3" MONITOR	801-DA6K-00019-00
6	NEC LCD SERVICE KIT, 21.3" MONITOR	801-DA6K-00021-00
7	BRACKET, DISPLAY MOUNTING BOTTOM	0406-00-0936-02
8	TOUCH PAD SERVICE KIT, 21.3" MONITOR	801-DA6K-00020-00
9	FRAME, MOUNTING, TOUCHPAD	0380-00-0622-01
10	SMALL SERVICE KIT, DA6K	801-DA6K-00110-00
11	FASTENER, RECLOSABLE, DUAL LOCK	0343-00-0120-01
12	CLIP PIECE, GROUNDING	0000-10-10996
2, 13, 14, 18	CABLES SERVICE KIT, 21.3" MONITOR	801-DA6K-00108-00
15	FRONT INTERFACE PCBA SERVICE KIT, MONITOR	801-DA6K-00004-00
16	CCFL INVERTER PCBA SERVICE KIT, 21.3" MONITOR	801-DA6K-00018-00
17	PLATE, FRONT ASSY, 21.3" MONITOR	0386-00-0364-01
19	ALARM LED PCBA SERVICE KIT, 21.3" MONITOR	801-DA6K-00017-00
20	ALARM LED INSULATION SHEET	047-006237-00
21	BRACKET, DISPLAY MOUNTING,TOP	0406-00-0936-01
22	LIGHTPIPE,LED,21.3"DCU	0380-00-0596-01
23	LABEL,LED,21.3"DCU	0334-00-1791-01

4.5 V Hub Assembly (P/N 0998-00-1803-01)



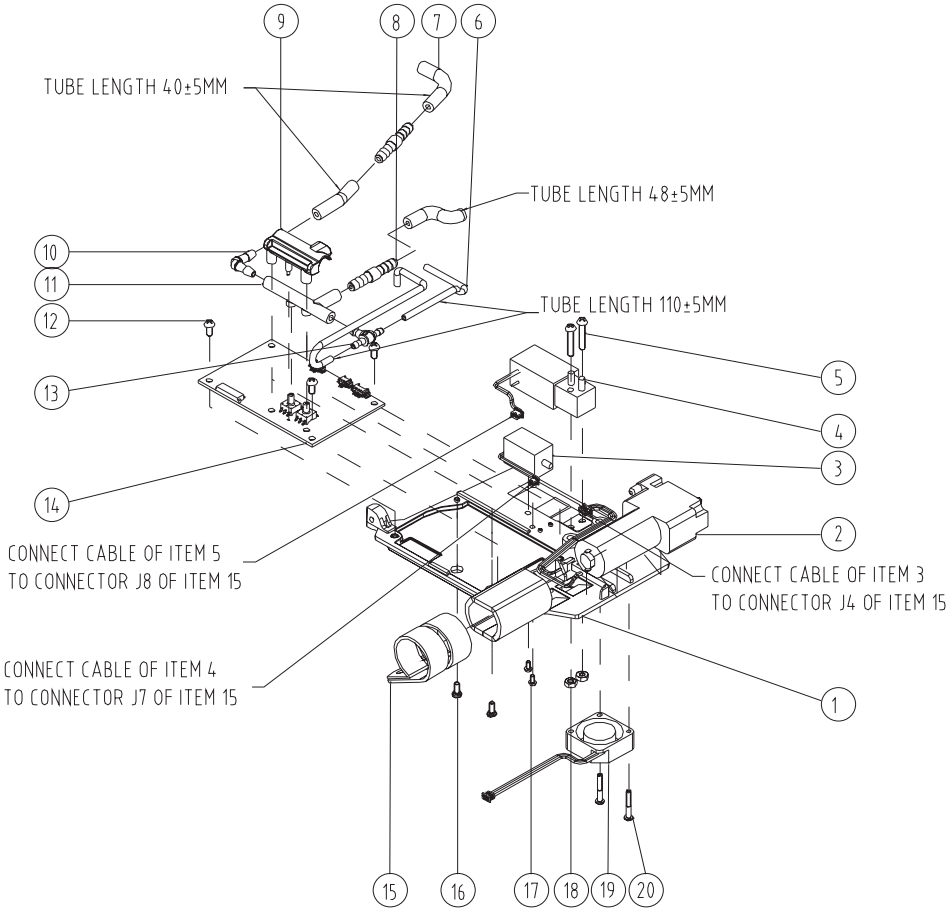
ITEM NO.	DESCRIPTION	PART NUMBER
	ASSEMBLY, V HUB	0998-00-1803-01
1	FRONT HOUSING SERVICE KIT, VHUB	801-DA6K-00028-00
2	PLATE, EAVE, V HUB	0380-00-0605-40
3, 4, 6, 14	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
5	V HUB PCBA SERVICE KIT	801-DA6K-00029-00
7	WHEEL, INDICATOR, LOCK/UNLOCK	0380-00-0627-01
8	GEAR, IDLER, INDICATOR MECHANISM	0380-00-0626-01
9	RETAINER,INDICATOR MECHANISM	0380-00-0628-01
10	GEAR, DRIVE, INDICATOR MECHANISM	0380-00-0625-01
11	BRACKET, MODULE LOCKING, V HUB	0380-00-0607-01
12	HOUSING,HANDLE, V HUB	0380-00-0605-30
13	BACK HOUSING SERVICE KIT, V HUB	801-DA6K-00027-00
15	V HUB QUICK RELEASE MOUNTING PLATE	045-000297-00
16	HOUSING, LOCK ASSEMBLY, V HUB	0380-00-0606-01
17	LOCK, SLOTTED	0105-00-0155-01
18	CAM, MODULE LOCKING, V HUB	0380-00-0608-01
19	SPRING,COMPRESSION	0214-00-0288-01

4.6 Assembly, Masimo VPS Module (P/N 0998-00-1802-0101A)



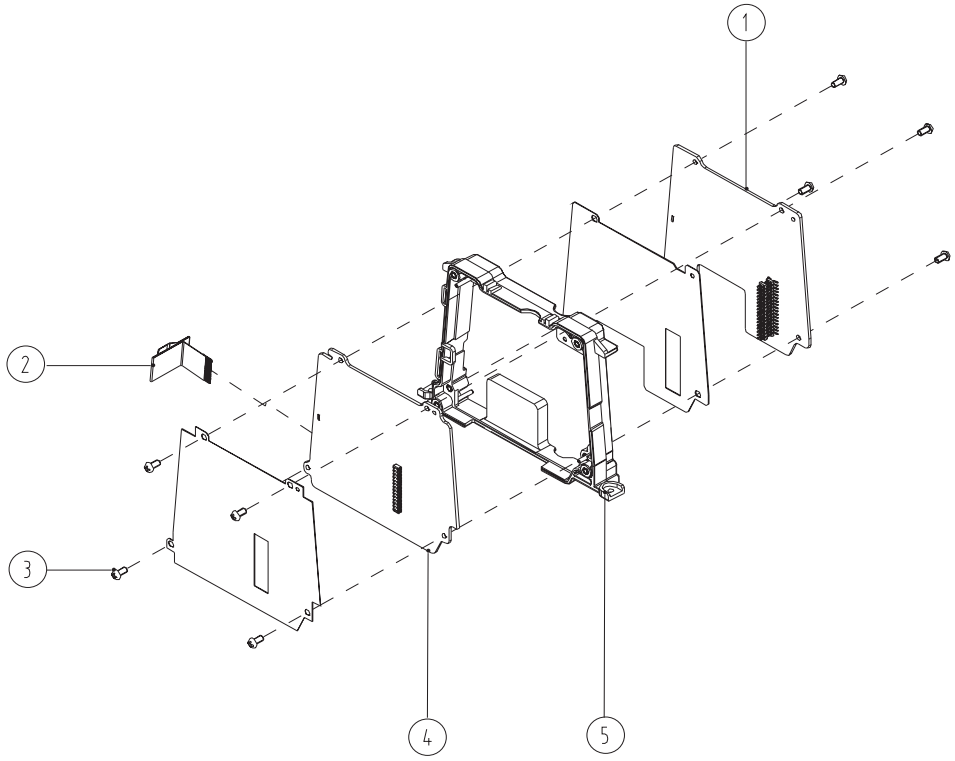
ITEM NO.	DESCRIPTION	PART NUMBER
	MASIMO VPS MODULE	0998-00-1802-0101A
1	KEYPAD AND OVERLAY SERVICE KIT, VPS	801-DA6K-00071-00
2	BACK HOUSING SERVICE KIT, VPS	801-DA6K-00050-00
3, 5, 6, 17,21, 22	SMALL PARTS SERVICE KIT, MODULE	801-DA6K-00113-00
4, 10, 12, 14	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
7, 13, 15, 16	CABLES SERVICE KIT, MODULE	801-DA6K-00109-00
8	SUBASSEMBLY, VPS FRONT END	0997-00-0611-01
9	ISOLATED HOST COM PCBA, VPS	801-DA6K-00081-00
11	MAIMO SpO_2 PCBA SERVICE KIT, VPS	801-DA6K-00079-00
18	INSTRUMENT CONNECTOR PCBA SERVICE KIT	801-DA6K-006200
19	NIBP SUBASSEMBLY SERVICE KIT, VPS	801-DA6K-006600
20	PATIENT CONNECTOR SUBASSY, MASI-VPS	801-DA6K-00058-00
23	SUBASSEMBLY, FRONT, 3X MODULE	0997-00-0612-03

4.6.1 Subassembly, Valve, Pneumatic (P/N 801-DA6K-00066-00)



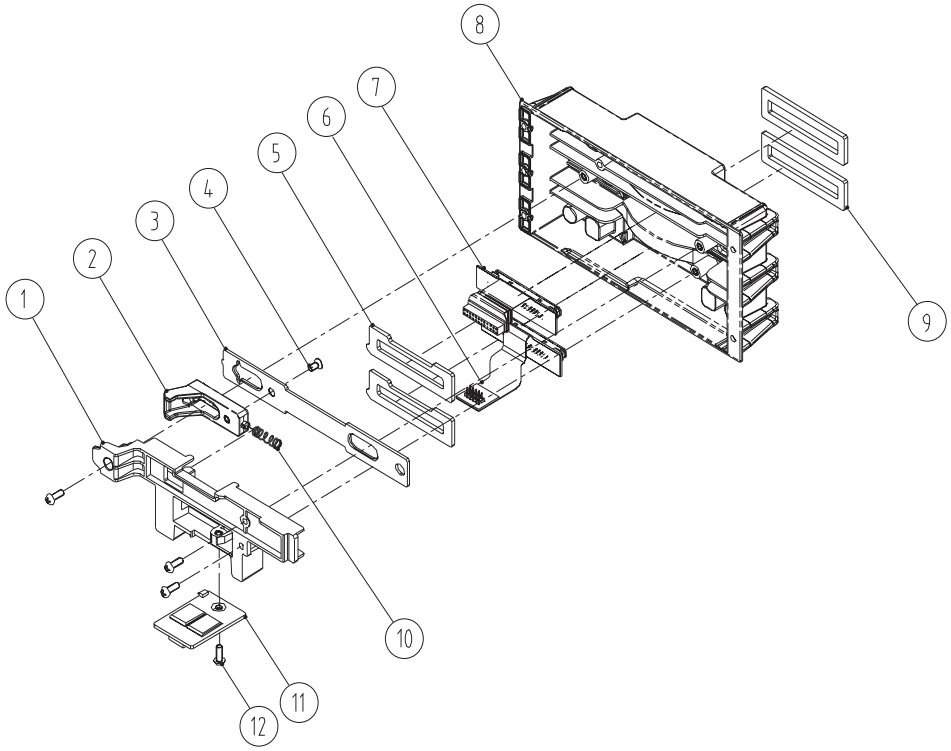
ITEM NO.	DESCRIPTION	PART NUMBER
	SUB-ASSY, VALVE, PNEUMATIC	801-DA6K-00066-00
1	CHASSIS,VPS, NIBP/SpO_2	0380-00-0623-01
2	PUMP SERVICE KIT, VPS MODULE	801-DA6K-00067-00
3	DUMP VALVE SERVICE KIT	801-DA6K-00102-00
4	LINEAR BLEED VALVE SERVICE KIT	801-DA6K-00100-00
5, 12, 16, 17, 18, 20	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6, 7, 8, 9, 10, 11,13	TUBE AND FITTING SERVICE KIT, NIBP	801-DA6K-00106-00
14	NIBP PCBA SERVICE KIT, VPS	801-DA6K-00080-00
15	NIBP FIXED BUTTON, ID, 22.2 MM,WHITE NYLON	0343-00-0116-01
19	SMALL FAN SERVICE KIT, VPS MODULE	801-DA6K-00090-00

4.6.2 Subassembly, VPS Front End (P/N 0997-00-0611-01)



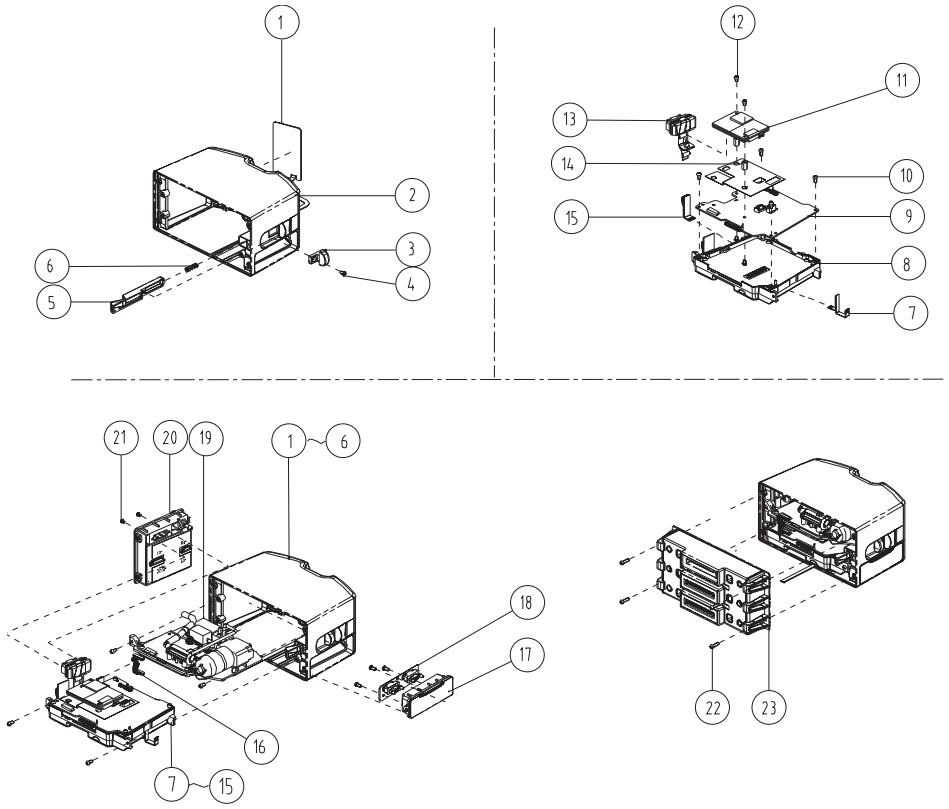
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, VPS FRONT END	0997-00-0611-01
1	IBP_TEMP PCBA SERVICE KIT, VPS	801-DA6K-00083-00
2	CABLES SERVICE KIT, MODULE	801-DA6K-00109-00
3	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
4	ECG_RESP_DSP PCBA SERVICE KIT, VPS	801-DA6K-00082-00
5	CHASSIS,VPS,FE/HCB	0380-00-0585-01

4.6.3 Subassembly, Front, 3X Module (P/N 0997-00-0612-03)



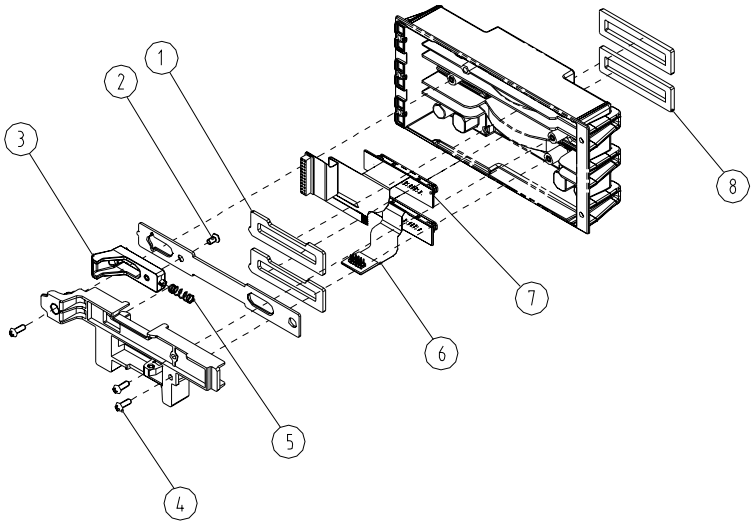
ITEM NO.	DESCRIPTION	PART NUMBER
	SUBASSEMBLY, FRONT, 3X MODULE	0997-00-0612-03
1	SUPPORT, MODULE MECHANISM,CO_2/RECORDER	0380-00-0591-02
2, 5, 9, 10	SMALL PARTS SERVICE KIT, MODULE	801-DA6K-00113-00
3	LATCH, MODULE	0386-00-0345-01
4, 12	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, SSD MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00104-00
7	FPC, HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
8	FRONT HOUSING SERVICE KIT, 3X MODULE	801-DA6K-00070-00
11	USB STORAGE PCBA SERIVICE KIT, VPS	801-DA6K-00091-00

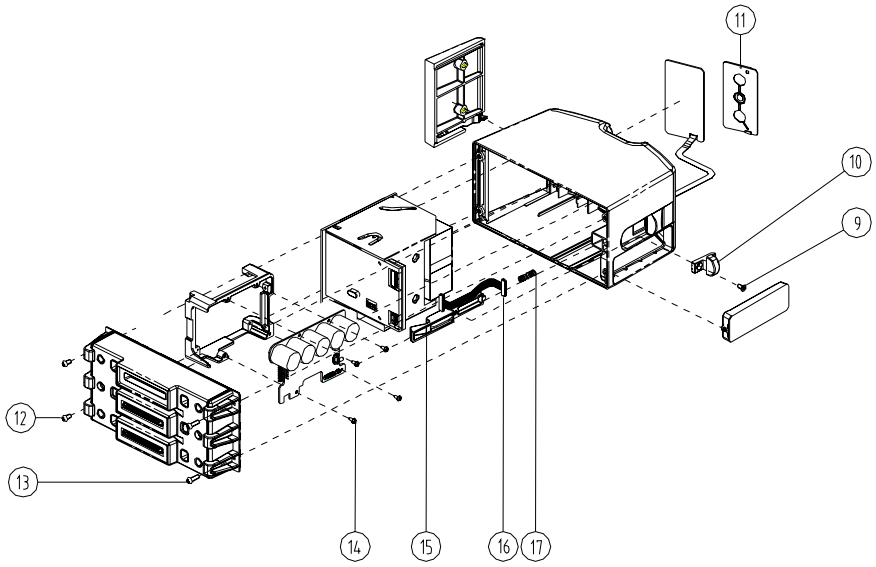
4.7 Assembly, Nellcor VPS Module (P/N 0998-00-1802-0102A)



ITEM NO.	DESCRIPTION	PART NUMBER
	NELLCOR VPS MODULE	0998-00-1802-0102A
1	KEYPAD AND OVERLAY SERVICE KIT, VPS	801-DA6K-00071-00
2	BACK HOUSING SERVICE KIT, VPS	801-DA6K-00050-00
3, 5, 6, 17	SMALL PARTS SERVICE KIT, MODULE	801-DA6K-00113-00
4, 10, 12, 14, 21, 22	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
7, 13, 15, 16	CABLES SERVICE KIT, MODULE	801-DA6K-00109-00
8	SUBASSEMBLY, VPS FRONT END	0997-00-0611-01
9	ISOLATED HOST COM PCBA, VPS	801-DA6K-00081-00
11	NELLCOR SpO_2 PCBA SERVICE KIT, VPS	801-DA6K-00078-00
18	INSTRUMENT CONNECTOR PCBA SERVICE KIT	801-DA6K-00062-00
19	NIBP SUBASSEMBLY SERVICE KIT, VPS	801-DA6K-00066-00
20	PATIENT CONNECTOR SUBASSY, NELL VPS	801-DA6K-00057-00
23	SUBASSEMBLY, FRONT, 3X Module	0997-00-0612-03

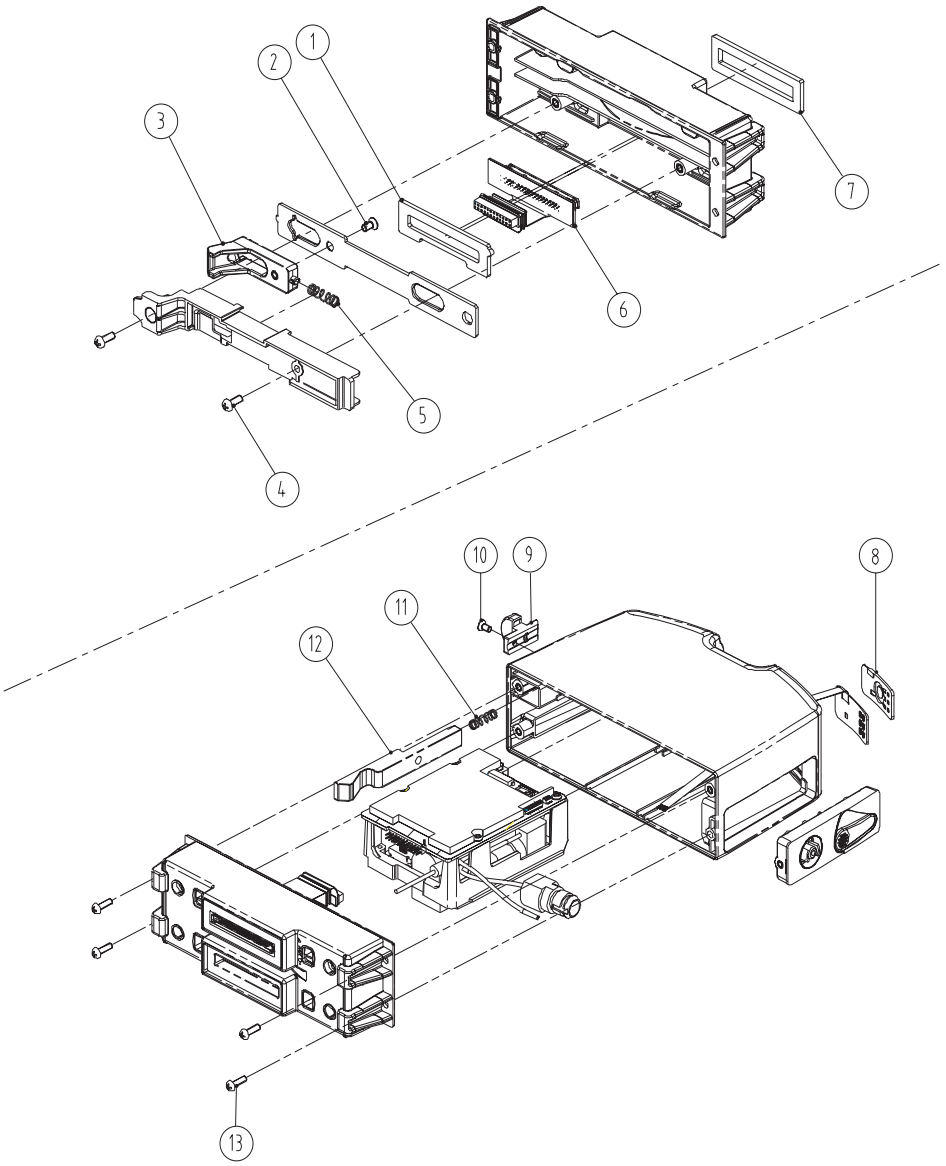
4.8 Assembly, Recorder, Module (P/N 0998-00-1802-0202A)





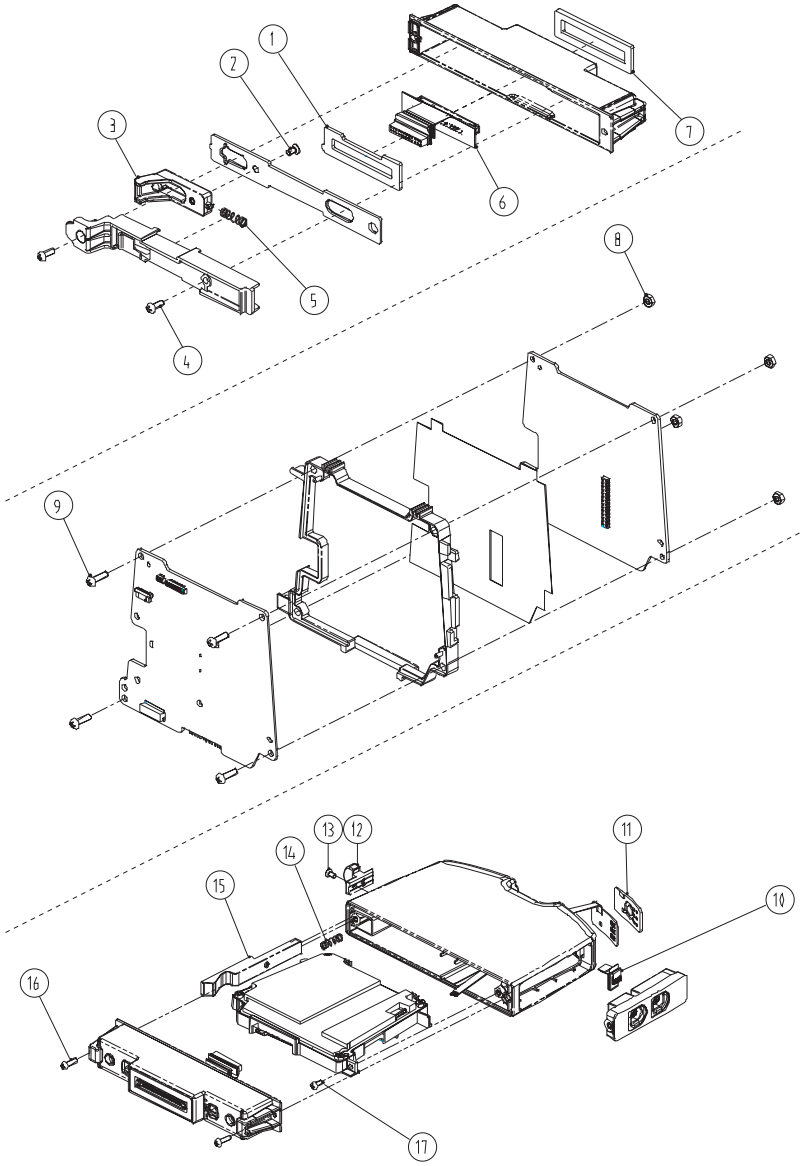
ITEM NO.	DESCRIPTION	PART NUMBER
	RECORDER MODULE	0998-00-1802-0202A
1, 3, 5, 8, 10, 15, 17	SMALL PARTS SERVICE KIT, ALL MODULES	801-DA6K-00113-00
2, 4, 9, 12, 13, 14	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, SSD MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00104-00
7	FPC, REC MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00105-00
11	OVERLAY SERVICE KIT, ALL MODULES	801-DA6K-00116-00
16	CABLES SERVICE KIT, ALL MODULES	801-DA6K-00109-00

4.9 Assembly, CO_2 Module (P/N 0998-00-1802-0301A)



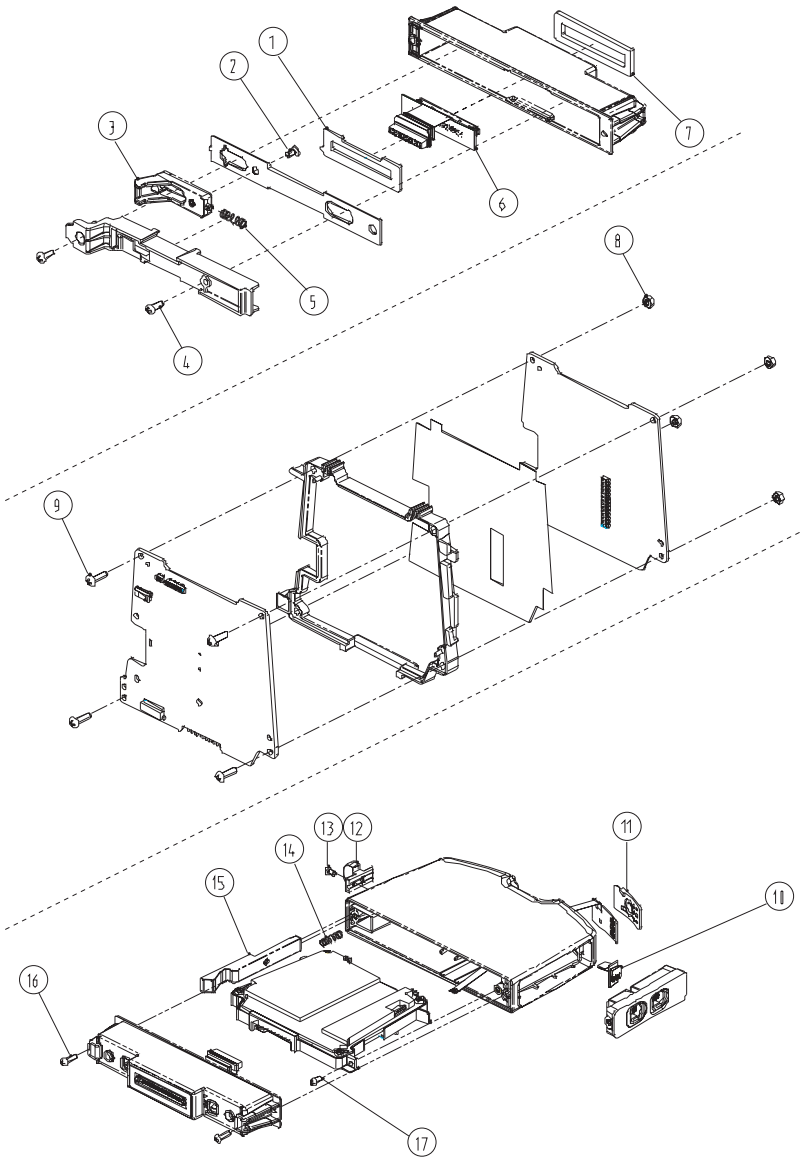
ITEM NO.	DESCRIPTION	PART NUMBER
	CO_2 MODULE	0998-00-1802-0301A
1, 3, 5, 7, 9, 11, 12	SMALL PARTS SERVICE KIT, ALL MODULES	801-DA6K-00113-00
2, 4, 10,13	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
8	OVERLAY SERVICE KIT, ALL MODULES	801-DA6K-00116-00

4.10 Assembly, Temperature Module (P/N 0998-00-1802-0501A)



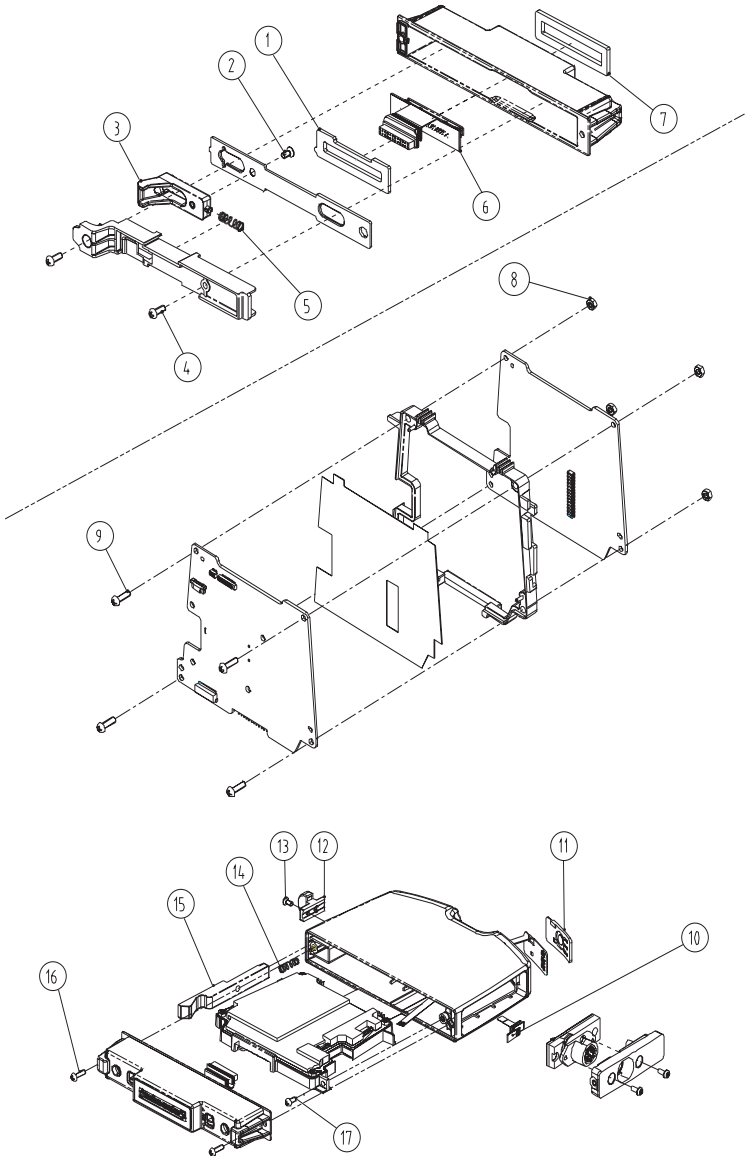
ITEM NO.	DESCRIPTION	PART NUMBER
	TEMPERATURE MODULE	0998-00-1802-0501A
1, 3, 5, 7, 12, 14, 15	SMALL PARTS SERVICE KIT, ALL MODULES	801-DA6K-00113-00
2, 4, 8, 9, 13, 16, 17	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
10	CABLES SERVICE KIT, ALL MODULES	801-DA6K-00109-00
11	OVERLAY SERVICE KIT, ALL MODULES	801-DA6K-00116-00

4.11 Assembly, IBP Module (P/N 0998-00-1802-0401A)



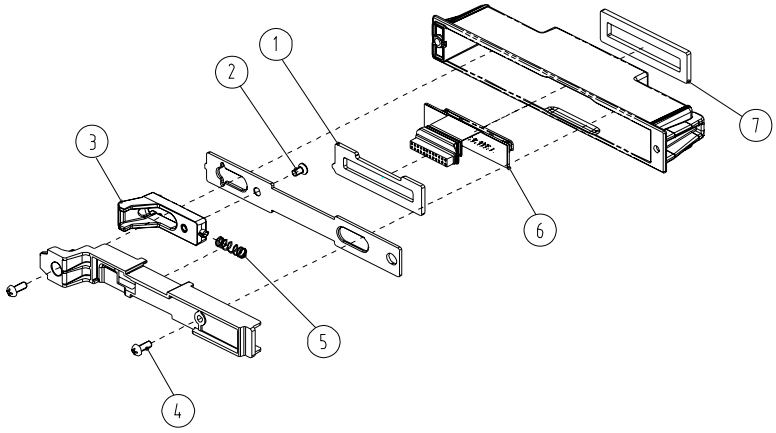
ITEM NO.	DESCRIPTION	PART NUMBER
	IBP MODULE	0998-00-1802-0401A
1, 3, 5, 7, 12, 14, 15	SMALL PARTS SERVICE KIT, ALL MODULES	801-DA6K-00113-00
2, 4, 8, 9, 13, 16, 17	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
10	CABLES SERVICE KIT, ALL MODULES	801-DA6K-00109-00
11	OVERLAY SERVICE KIT, ALL MODULES	801-DA6K-00116-00

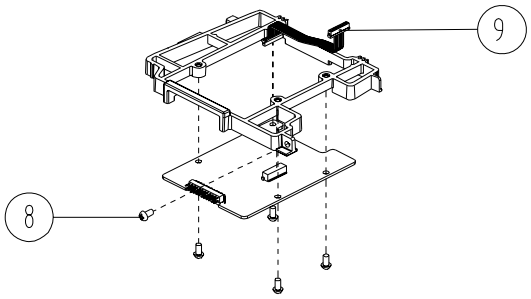
4.12 Subassembly, Cardiac Output (C.O.) Module (P/N 0998-00-1802-0701A)

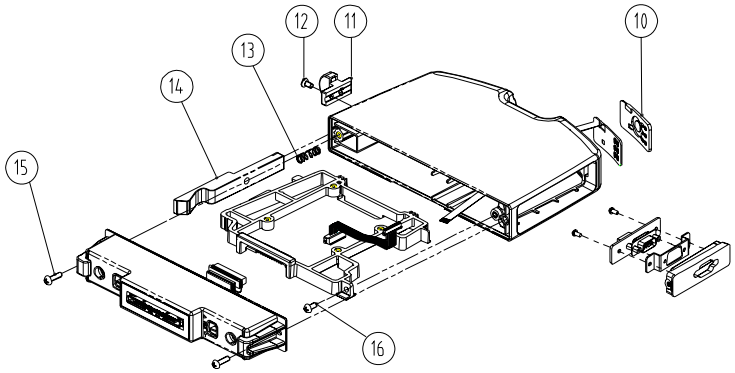


ITEM NO.	DESCRIPTION	PART NUMBER
	CARDIAC OUTPUT (C.O.) MODULE	0998-00-1802-0701A
1, 3, 5, 7, 12, 14, 15	SMALL PARTS SERVICE KIT, ALL MODULES	801-DA6K-00113-00
2, 4, 8, 9, 13, 16, 17	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC, HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
10	CABLES SERVICE KIT, ALL MODULES	801-DA6K-00109-00
11	OVERLAY SERVICE KIT, ALL MODULES	801-DA6K-00116-00

4.13 Assembly, VDI, Module (P/N 0998-00-1802-0801A)



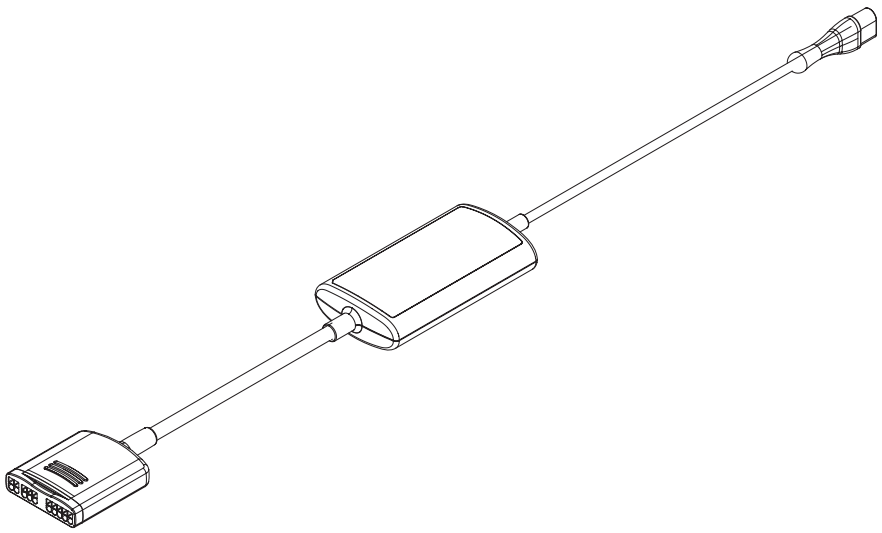




ITEM NO.	DESCRIPTION	PART NUMBER
	VDI (VIGIL DEVICE INTEGRATOR) MODULE	0998-00-1802-0801A
1, 3, 5, 7, 11, 13, 14	SMALL PARTS SERVICE KIT ALL MODULE	801-DA6K-00113-00

ITEM NO.	DESCRIPTION	PART NUMBER
2, 4, 8, 12, 15,16	SCREWS SERVICE KIT, DA6K	801-DA6K-00110-00
6	FPC,HCB MODULE BAY INTERFACE SERVICE KIT	801-DA6K-00103-00
9	CABLES SERVICE KIT ALL MODULES	801-DA6K-00109-00
10	OVERLAY SERVICE KIT ALL MODULES	801-DA6K-00116-00

4.14 Subassembly, Module, ECG, 12 Lead (P/N 0998-00-1804-01/0998-00-1804-02)



ITEM NO.	DESCRIPTION	PART NUMBER
N/A	12 LEAD DEVICE CABLE	0998-00-1804-01
N/A	12 LEAD DEVICE CABLE (IEC)	0998-00-1804-02

5.0 Diagnostics and Calibration

5.1 Introduction

The following procedures are provided to verify the proper operation of the **V Series** Patient Monitor. Service Diagnostics provide the capability of diagnosing problems within the **V 12/V 21** hardware. A menu driven interface similar to that of the **V 12/V 21** user interface is used to execute all tests.

CAUTION: Do not perform calibration while monitoring a patient.

5.2 Warnings and Guidelines

In the event that the instrument covers are removed, observe the following warnings and general guidelines:

1. Do not short component leads together.
2. Perform all steps in the exact order given.
3. Use extreme care when reaching inside the opened instrument. Do not contact exposed metal parts which may become electrically active.
4. Read and understand each step of the procedure prior to beginning the step.

5.3 System Setup

5.3.1 Introduction

The **V 12/V 21** System Setup dialog provides access to the system default settings such as date and time format, parameter timeouts, enabling/disabling lethal alarms, Quick Functions buttons, default printers, service mode, and password updates. Access to this dialog **requires** a password.

5.3.2 System Dialog

The **System** dialog, located in the **Setup** tab, (shown in FIGURE 5-1) contains the following tabs:

- General
- Alarms
- Printer
- Network
- System

A description of each tab follows.

5.3.2.1 Navigating to the System Dialog

1. From the Navigation Area, select the **Setup** tab.
2. Select the **System** button.

NOTE: **The icon in the System button indicates that a password is required to access the System dialog.**

3. Enter the password (defaulted to SYSTEM and can be changed).
4. Select the **Accept** button to display the **System** dialog (shown in FIGURE 5-1).

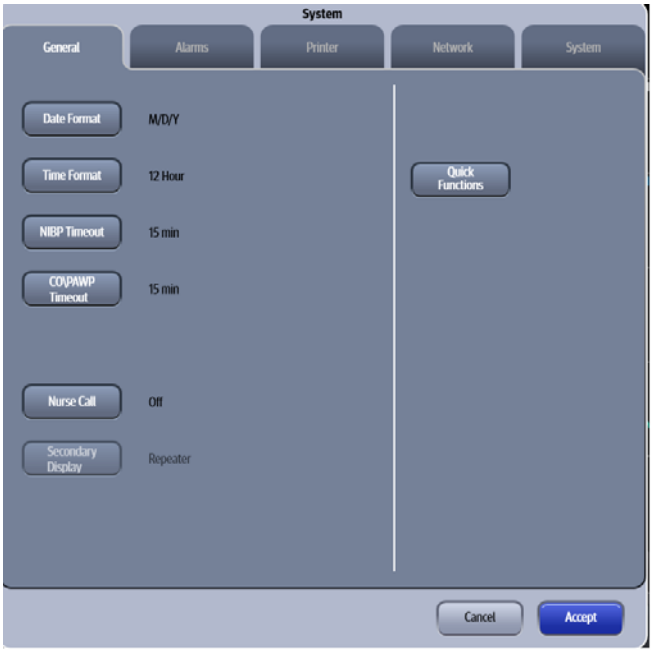


FIGURE 5-1 Example System Dialog (General Tab)

5.3.2.2 Configuring the General Tab

Select the **General** tab to configure the screen formats, timeouts, display setup, and Quick Functions buttons. These functions apply to all patient sizes.

1. From the System dialog, select the **General** tab (shown in FIGURE 5-1).

NOTE: The current setting displays beside the tab button.

2. Configure the parameter using the tab buttons described in TABLE 5-1.

TABLE 5-1

BUTTON	DESCRIPTION / COMMENTS	CHOICES*
Date Format	Changes the format in which dates are displayed in the system.	D/M/Y, Y/M/D, **M/D/Y**
Time Format	Changes the format in which time is displayed in the system.	**12 Hr**, 24 Hr
NIBP Timeout	Determines the time interval at which the NIBP measurement is automatically removed from the Main Display.	**15 min**, 30 min, 45 min, 1 hr
CO\PAWP Timeout	Determines the time interval at which the CO/PAWP measurement is automatically removed from the Main Display.	**15 min**, 30 min, 45 min, 1 hr
Nurse Call	Sends an electronic signal to the Nurse Call system when an alarm is active.	**Off**, One-Shot, Continuous
	NOTE: When Nurse Call is configured for Off, the Alarm Responses dialog does not display the Nurse Call column.	
Quick Functions	Configures the buttons in the **Quick Functions** tab in Navigation Area.	Refer to the "Configuring the Quick Functions Tab" on page 5-3 for additional information.

* *The default configuration selections are in bold.*

3. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.3 Configuring the Quick Functions Tab

The **Quick Functions** tab may be configured to include six (6) predefined keys. These functions apply to all patient sizes.

To select the **Quick Function Keys** buttons:

1. From the **General** tab, select the **Quick Functions** button to display the **Quick Function Keys** dialog (shown in FIGURE 5-2).

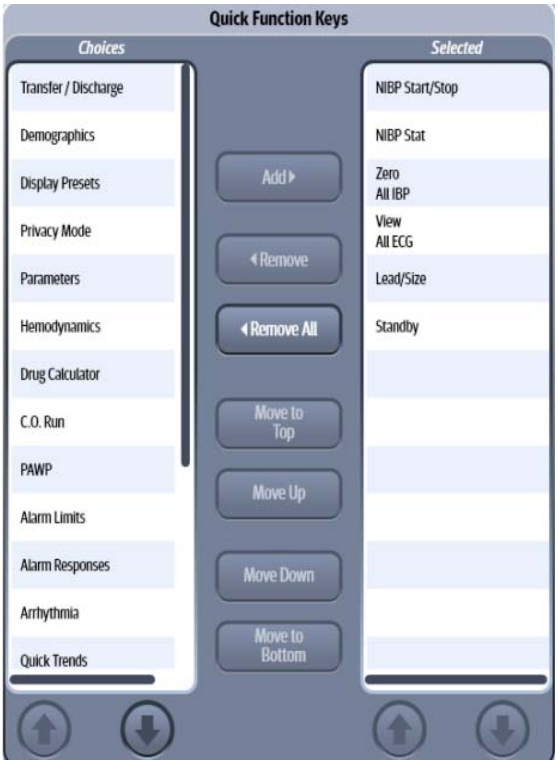


FIGURE 5-2 Example Quick Function Keys Dialog

2. Select from the available choices listed in TABLE 5-2.

NOTE: **The order of the keys shown in the Quick Function row of the Navigation Area is dependent on how the keys are ordered in the Quick Function Keys dialog list box. For example, in FIGURE 5-2, the NIBP Start/Stop key is listed first and displays as the first button in the Quick Functions row.**

TABLE 5-2

• **NIBP Start/Stop**	• **NIBP Stat**
NOTE: **The NIBP Start/Stop and NIBP Stat keys only display in the Navigation Area provided NIBP or NIBP List is configured to display in the Display Setup configuration.**	
• **Zero All IBP**	• **View All ECG**
• Print 12-Lead	• Alarm Responses
• Transfer/Discharge	• Arrhythmia
• Demographics	• Quick Trends
• Display Presets	• List Trends
• Privacy Mode	• Relearn Arrhythmia
• Parameters	• Relearn ST
• Hemodynamics	• ST Review
• Drug Calculator	• NIBP Interval

** The default configuration selections are in bold*

TABLE 5-2

• C.O. Run	• ECG Menu
• PAWP	• Quick Trends
• PA Insertion	• Graphic Trends
• Alarm Limits	• Full Disclosure
• Events	

** The default configuration selections are in bold*

3. Use the buttons described in TABLE 5-3 to navigate around this dialog.

TABLE 5-3

BUTTON	DESCRIPTION
Add	Adds the selected choice to the Selected list (located to the right of the navigation buttons).
Remove	Removes the selected choice from the Selected list.
Remove All	Removes all the choices from the Selected list and moves them back to the Choices list (located to the left of the navigation buttons).
Move to Top	Moves the highlighted choice to the top position in the Selected list.
Move Up	Moves the choice in the Selected list up one position.
Move Down	Moves the choice from the Selected list down one position.
Move to Bottom	Moves the cursor up by one in the Selected list.

4. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.4 Configuring the Alarms Tab

Select the **Alarms** tab to configure the alarm silencing, lethal alarms, alarm delays, and other alarm related settings. Except for the Lethal Alarms and Apnea Detection, which apply to Adult and Pediatric patient sizes only the other alarm settings apply to all patient sizes.

To configure the Alarms tab:

1. From the System dialog, select the **Alarms** tab to display the Alarms dialog (shown in FIGURE 5-3).

FIGURE 5-3 Example System Dialog (Alarms Tab)

2. Configure the tab using the buttons described in TABLE 5-4.

TABLE 5-4

BUTTON	DESCRIPTION / COMMENTS	CHOICES*
Silence All	Allows an authorized user to choose which settings are available in the Alarm Setup dialog Silence All functions. This setting controls how long an alarm is muted.	France only: **1,2 min** 1, 2, 5 min 1, 2, 5, 10 min Other countries: 1,2 min 1, 2, 5 min **1, 2, 5, 10 min** 1, 2, 5,10 min, Permanent
	NOTE: The Silence All configuration applies to all patient sizes.	
Lethal Alarms	Allows an authorized user to determine whether or not a user can modify the lethal arrhythmia settings and decide whether Asystole, VTach and VFib alarms can be turned off by the user.	Locked **Unlocked**

* *The default configuration selections are in bold.*

TABLE 5-4

BUTTON	DESCRIPTION / COMMENTS	CHOICES*
Apnea Alarms	Allows an authorized user to enable Apnea alarms at the monitor.	Locked **Unlocked**
	NOTE: Apnea Detection is always enabled when patient size is Neonate.	

* *The default configuration selections are in bold.*

3. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.5 Configuring the Printer Tab

Select the **Printer** tab to configure up to three (3) laser printers. These functions apply to all patient sizes.

To configure the Printer tab:

1. From the System dialog, select the **Printer** button to display the Printer dialog (shown in FIGURE 5-4).

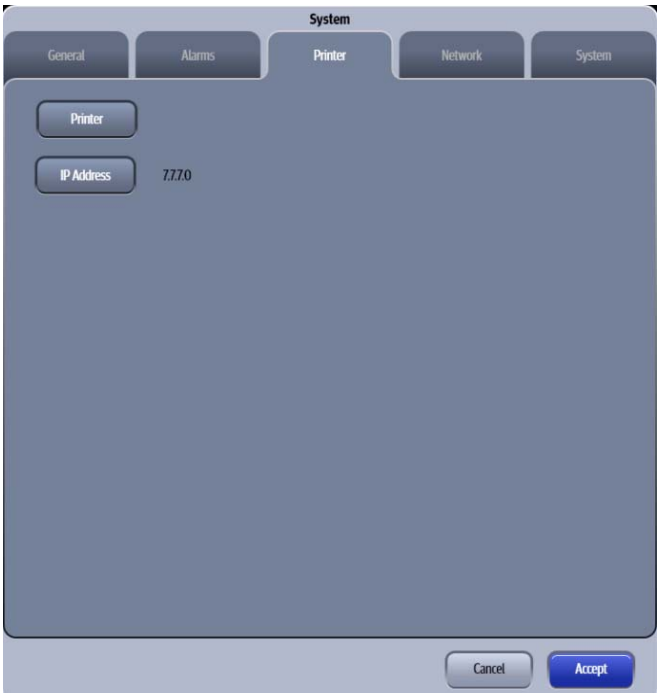


FIGURE 5-4 Example System Dialog (Printer Tab)

2. Configure the tab using the buttons described in TABLE 5-5.

TABLE 5-5

BUTTON/ CHECK BOX	DESCRIPTION / COMMENTS	CHOICES*
Printer	Allows an authorized user a means to specify a name for each laser printer. An example could be, department name, unit, or nurses station, etc.	Accepts up to 15 alphanumeric characters. Factory defaults to a blank value.
IP Address	Allows an authorized user to specify the laser printer IP address for each laser printer.	Accepts up to 15 digital characters. Factory default 7.7.7.0

* *The default configuration selections are in bold.*

3. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.6 Configuring the Network Tab

Select the **Network** tab to define the hospital name, department, and indicate if the monitor will be networked to another monitor or to a central station. These functions apply to all patient sizes.

1. From the System dialog, select the **Network** button to display the Network dialog (shown in FIGURE 5-5).

FIGURE 5-5 Example System Dialog (Network Tab)

2. Configure the tab using the buttons described in TABLE 5-6.

TABLE 5-6

BUTTON/ CHECK BOX	DESCRIPTION / COMMENTS	CHOICES*
Hospital	Provides clinician or biomedical engineer a means to specify the hospital name.	Accepts up to 15 alphanumeric characters. Factory defaults to blank.
Department	Provides clinician or biomedical engineer a means to specify the hospital name.	Accepts up to 15 digital characters. Factory defaults to blank.
Wired	Select to enter the IP Address and Subnet Mask.	Factory default IP address 7.6.6.0. Factory default Subnet Mask is 255.255.255.0.

* *The default configuration selections are in bold.*

3. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.7 Configuring the System Tab

Select the **System** tab to configure the demo mode and service settings. These functions apply to all patient sizes.

To configure the System tab:

1. From the **Setup** tab, enter the required password (SYSTEM) and select the **System** button to display the System dialog (shown in FIGURE 5-6).

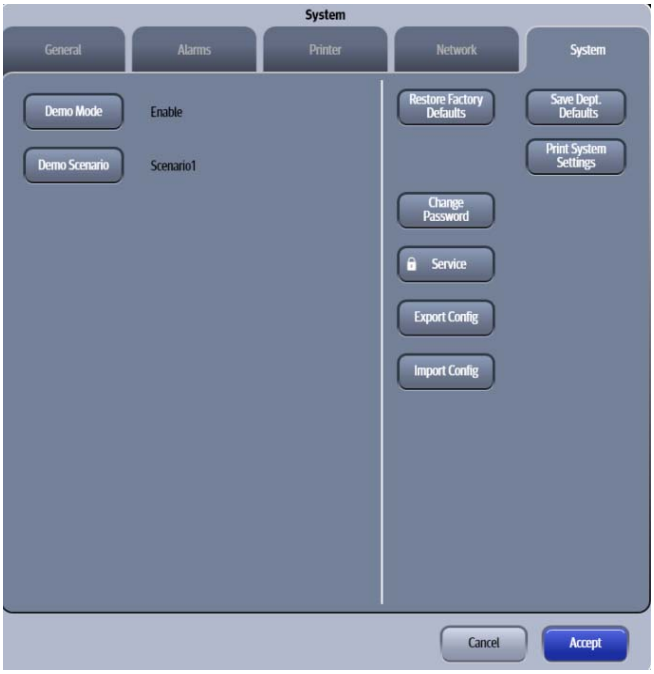


FIGURE 5-6 Example System Dialog (System Tab)

2. Configure the tab using the buttons described in TABLE 5-7.

TABLE 5-7

BUTTON/ CHECK BOX	DESCRIPTION / COMMENTS	CHOICES*
Demo Mode	Allows an authorized user to choose a demonstration mode for in-servicing staff or testing product features.	Enable, **Disable**
Demo Scenario	Allows an authorized user various demonstration scenarios that are intended to non-clinical conditions.	List all scenarios contained in the Scenarios folder. **Scenario1**
Restore Factory Defaults	Allows an authorized user to reestablish the original database power up settings to factory default values.	N/A
	CAUTION: **Restart the V 12/V 21 after restoring factory defaults. The monitor returns to its factory default state after the restart.**	
	NOTE: **Refer to "Restoring Factory Defaults"on page 5-10 for a list of exceptions.**	
Change Password	Allows an authorized user to change the system password.	N/A
Service	Allows an authorized user access to the password protected Service Diagnostic mode.	N/A
Export Config	Copies the current settings to the external drive.	N/A
Import Config	Copies the settings from the external drive to the **V 12/V 21** unit.	N/A
Save Dept. Defaults	Allows an authorized user to save the current monitor settings as the new power up settings.	N/A
Print System Settings	Prints all the system settings by patient size.	N/A

* *The default configuration selections are in bold.*

3. Select **Cancel** or **Accept**.

- The **Cancel** button closes the dialog without saving the settings.
- The **Accept** button saves the settings and closes the dialog.

5.3.2.7.1 Restoring Factory Defaults

The following settings are not affected when the **Restore Factory Defaults** button is selected because they are tied to regional settings:

- Date
- Time
- Temperature
- Language
- Country

CAUTION: **Restart the V 12/V 21 after restoring factory defaults. The monitor returns to its factory default state after the restart.**

NOTE: **A password is required prior to restoring the current database values to the factory default values.**

5.3.2.7.2 Importing/Exporting Configuration Settings

1. Insert a serial bus device in one of the serial ports.
2. From the **System** tab, select the **Export Config** or **Import Config button**. A message displays warning not to remove the USB device and a progress bar displays.
3. The files are copied to or from the unit. A message indicating that the files were copied is displayed.

5.3.2.7.3 Saving Dept. Defaults

The following settings are not affected when the **Save Dept. Defaults** button is selected because the setting is intended to be temporary:

- Notch Filter
- ESU Filter

NOTE: **A confirmation message displays prior to saving the department default settings as the power up settings.**

5.3.2.8 Changing Password

Select the **Change Password** button to configure the desired password for system tab.

To change the system password:

1. From the System tab, select the **Change Password** button to display the Enter Password dialog (shown in FIGURE 5-7).

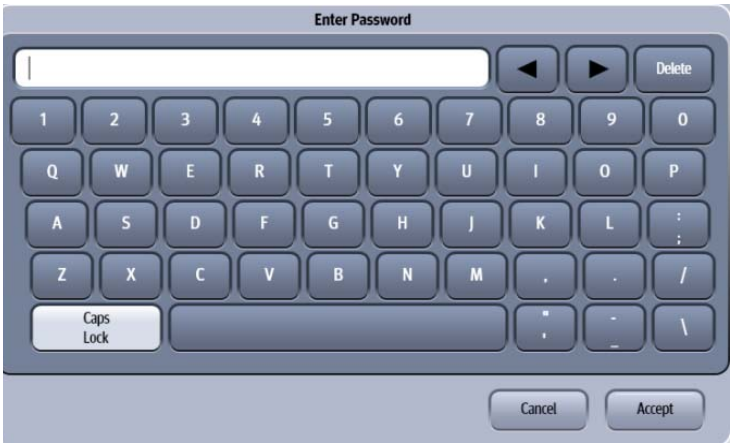


FIGURE 5-7 Example of Entering Password

2. Enter the password (defaulted to SYSTEM or the existing password) and click **Accept.**
3. Enter the desired password into the **Create Password** dialog (shown in FIGURE 5-8).

FIGURE 5-8 Example of Creating Password

4. Enter the new password again into the Verify Password dialog (shown in FIGURE 5-9).

FIGURE 5-9 Example of Verifying Password

5. Once the new password is set successfully, the following screen will display indicating successful password setting. Select the **Continue** button to proceed.

FIGURE 5-10 Example Password Changed Confirmation

5.3.2.9 Changing Password to Access Service Menu

Select the **Change Password** button to configure the desired password for **Service** tab.

To change the Service password:

1. From the **System** tab, select the **Service** button.
2. Enter the required password (defaulted to SERVICE) to display the Service menu (shown in FIGURE 5-11).

FIGURE 5-11 Example Service Menu

3. Select the **Change Password** button and repeat Steps1 through 5 in section "Changing Password" on page 5-12.

5.3.3 Configuration Management

If the monitor is inadvertently powered down (due to power failure or battery depletion), monitor settings are recovered as follows:

- Restarting the monitor within 60 seconds restores the latest user-settings.
- Restarting the monitor after 60 but before 120 seconds restores the settings by either the latest user-settings or the user-saved settings.
- Restarting the monitor after120 seconds restores the user-saved configurations.

5.4 System Information Page

To enter the system information page:

1. Select **Tools** tab from the navigation area.
2. Select **System Information** tab from Tools.
3. Select **DCU** or **Modules** from **System Information** to display DCU or module information. FIGURE 5-12 takes module information as an example.

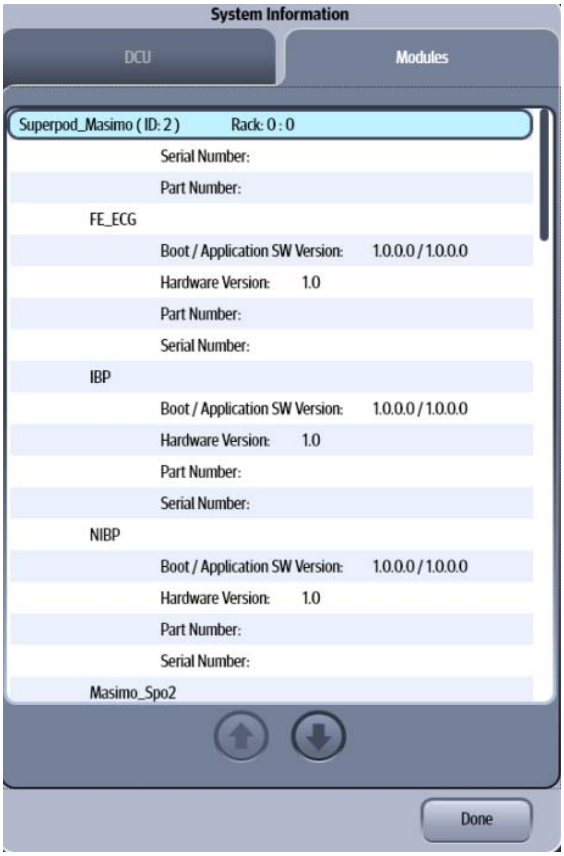


FIGURE 5-12 Example Module Information

5.5 NIBP Calibration

The purpose of this test is to verify the pressure transducer sensitivity for optimal accuracy.

Tools required:

- Manometer
- Bulb valve
- Test chamber
- Tubing
- T-shape connector

1. Connect the equipment as shown below.

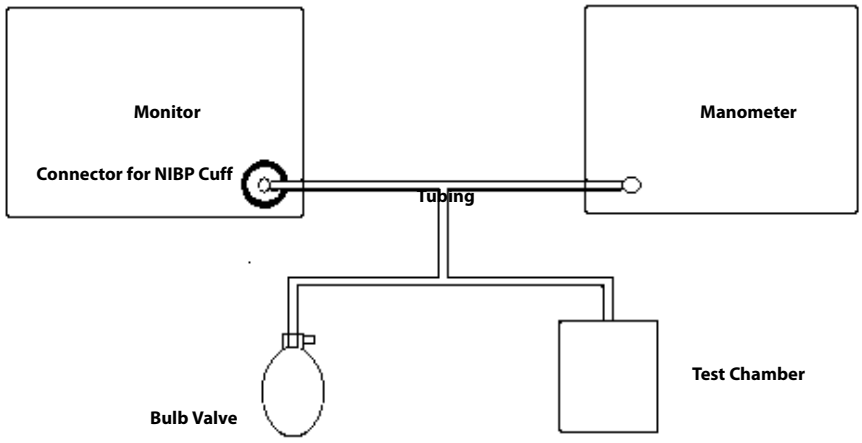


FIGURE 5-13 Example NIBP Calibration

2. Select **Service** tab from **System** menu (shown in FIGURE 5-6) to display **NIBP Calibration** screen.

3. Select **Adjusted Value (Reference Pressure)** to set the calibration reference pressure.

FIGURE 5-14 Example NIBP Calibration Screen

NOTE: **The adjusted value can be set from 240 mmHg to 260 mmHg. The default pressure is 250 mmHg and input step is 1 mmHg.**

4. Select **Start** to activate the calibration.
5. After inflation, wait 10 seconds for the measured value to settle.
6. Adjust the up or down arrow to match the measured value.
7. When the pressure displayed on the manometer matches the reference pressure, select **Accept** to accept the calibrated result. Then, select **Done** to complete the calibration.

Verification of NIBP Calibration

1. Select **Start.**
2. After inflation, verify the measured value is that of the manometer or mercury column. (Specification: +/- 4mmHg)
3. Select **Done**.

5.6 Microstream® CO_2 Calibration

It is recommended that, in order to provide accuracy verification of the CO_2, calibration is performed once a year, or whenever CO_2 readings appear suspicious. The date of the last successful calibration appears on the Calibration CO_2 Menu.

NOTE: **For maximum accuracy during calibration, a 20 minute warm-up time is recommended.**

Tools required:

- Gas cylinder
- T-shape connector
- Tubing

1. Select **Calibrate** from the **CO_2** Menu. The same menu can be accessed by selecting the **Setup** tab and **Parameters**, then **CO_2**.

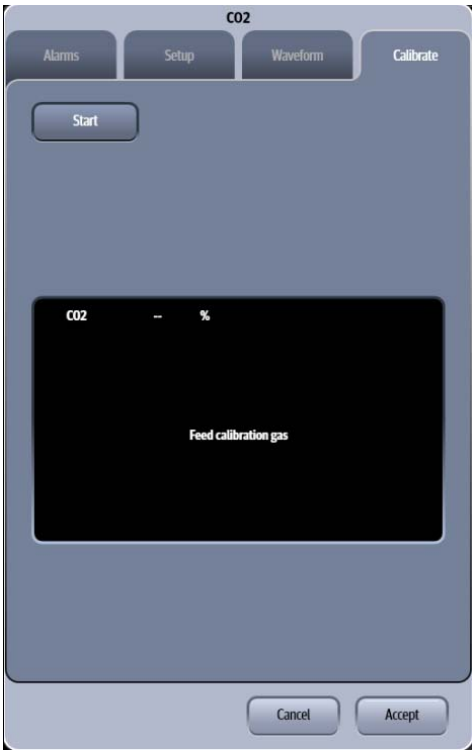
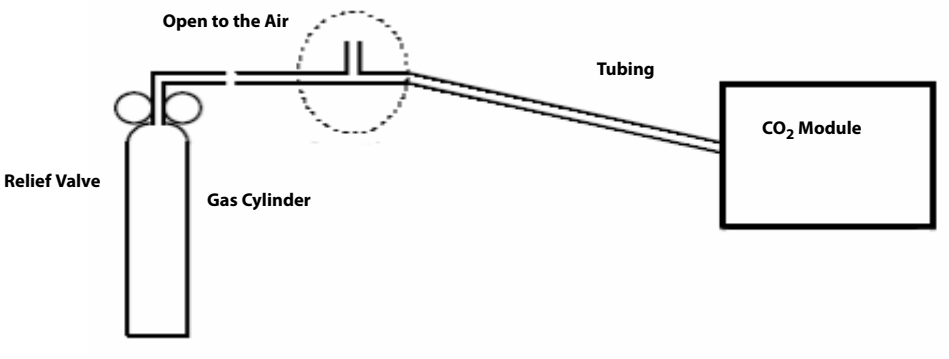


FIGURE 5-15 Example CO_2 Calibration screen

2. Connect the gas cylinder with the tubing using a T- connector as follows. Check the airway and make sure there are no leaks.



3. Open the relief valve to vent calibration gas, (P/N 0075-00-0033-01) and make sure that there is an excess gas flow through the T-shape connector to air and CO_2 reading is displayed during the calibration.
4. After the measured CO_2 concentration becomes stable, select **Start** to calibrate the CO_2 module, the message **Calibrating, continue to apply 5% CO_2** will appear in the **Calibration Menu**.When the calibration is complete, the message will change to **Calculating, calibration gas can be removed**. Turn off the button on the canister, and remove the connector.
5. After a moment, the message will change to **Calibration Completed Successfully CO_2**. The date and time of the successful calibration will appear in the **Calibration Menu**.

NOTE: **If no gas is being delivered, or the mixture does not contain 5% CO_2, the message "Calibration error. Caused by no gas or wrong gas concentration" will appear. In this case, perform another calibration.**

6. Select **Accept** tab in the CO_2 menu and the monitor returns to normal display screen.

5.7 Microstream® CO_2 Leakage Test

1. Plug the module into the V Hub.
2. Wait until CO_2 warm up is finished and then use your hand to completely block the gas inlet of the sampling line.
3. The alarm message **Purge** is displayed on the screen after certain time. Keep on blocking the gas inlet. If the alarm message **Occlusion** is shown, it indicates that the module does not leak.

5.8 Touchscreen Calibration

To access the touchscreen calibration screen:

1. Select the **Setup** tab from the navigation area.
2. Select the **Display** tab.
3. Select **Touch Screen Calibration.**

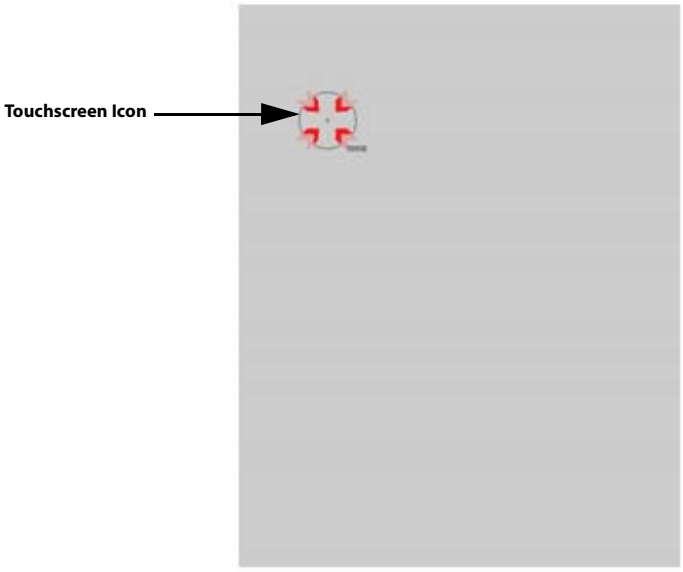


FIGURE 5-16 Touchscreen Calibration Screen

4. Press the center of the touchscreen icon and release it when the word "RELEASE" is prompted around the icon.
5. Once the touch screen calibration is completed, select **Accept.**

NOTE: **Make sure you complete the calibration procedure and accept it. If the touchscreen is accidentally mis-calibrated by selecting the wrong spot, you should access the touch screen calibration screen and calibrate it again.**

5.9 Verification

5.9.1 Initial Setup

5.9.1.1 V 12 Monitor Only

- Insert the VPS into the rear of the V 12 monitor.
- Insert the CO_2 module (if applicable) into the rear of the V 12 monitor.
- Insert the IBP modules (if applicable) into the rear of the V 12 monitor.
- Insert the recorder module (if applicable) into the rear of the V 12 monitor.
- Insert the CO module (if applicable) into the rear of the V 12 monitor.
- Insert the VDI module (if applicable) into the rear of the V12 monitor.
- Insert the V 12 monitor assembly into the V Dock and verify the V 12 monitor is locked in place.
- Insert the power cord P/N 0012-25-0001 into V Dock.
- Turn unit on and verify the initialization screen appears on screen.

NOTE: Please insert the modules one by one into the V 12 monitor.

5.9.1.2 V 12 Monitor with V Hub

- Insert the VPS into the rear of the V 12 monitor or V Hub.
- Insert the CO_2 module (if applicable) into the rear of the V 12 monitor or V Hub.
- Insert the IBP modules (if applicable) into the rear of the V 12 monitor or V Hub.
- Insert the recorder module (if applicable) into the rear of the V 12 monitor or V Hub.
- Insert the CO module (if applicable) into the rear of the V 12 monitor or V Hub.
- Insert the VDI module (if applicable) into the rear of the V12 monitor or V Hub.
- Insert the V 12 monitor assembly into the V Dock and verify the V 12 monitor is locked in place.
- Insert the power cord P/N 0012-25-0001 into V Dock
- Insert the interface cable from the V Hub to V Dock.
- Turn unit on and verify the initialization screen appears on screen.

5.9.1.3 First Turn On

Initialization at first turn on requires the user to set the country code and language. Select the appropriate country code and language accordingly.

Country Code

US, UK, Germany, France, Spain, Italy, Canada, Ireland, Switzerland, Belgium, Austria, Luxembourg, Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Paraguay, Peru, Uruguay, Venezuela.

Language

English, French, Spanish, German, Italian

NOTE: Some of the country codes and languages may be not currently available to all the V Series Patient Monitors.

5.9.2 ECG Tests

Tool required: Fluke Medsim 300B patient simulator recommended

5.9.2.1 Initialization

1. Use an ECG simulator (with Fluke Medsim 300B patient simulator recommended)and connect an ECG cable to the VPS. Set the ECG simulator to 60 bpms, 1mv QRS signal.
2. Observe that the trace display sweeps across the waveform 1 screen in five (5) seconds. There should be four (4) complete ECG cycles. The same display and timing should be seen on the Waveform 2 screen.
3. Check the following sweep speeds for the appropriate displays: 12.5 mm/sec - 10 second sweep/window.

5.9.2.2 Leads Off

1. Disconnect one lead at a time RA, RL, LL, LA, V1(C1) , V2(C2), V3 (C3), V4 (C4) , V5 (C5) and V6 (C6) from the simulator and observe that the message **Lead OFF** appears on the display.
2. Set the ECG simulator to **Short Leads.** Verify that the resolution does not exceed one pixel.

5.9.2.3 Pacer Detect

1. Set the Pacer Enhancement feature to **ON** in the **ECG Pacer Menu**.
2. Set the ECG simulator to **Ventricular Pacer.**
3. Verify the pacer pulse (yellow line) is displayed before the R wave of the QRS signal.

5.9.2.4 Heart Rate

1. Set the ECG simulator to ECG QRS Waveform. Set the rate to 251 bpm.
2. Verify the displayed rate is 251 ± 5 bpm.
3. Decrease the rate to 30 bpm and allow signal to stabilize. Verify that the displayed rate is 30 bpm ± 3 bpm.

5.9.2.5 Alarms

1. Set the simulator to 1mv ECG QRS signal and rate to 60 bpm
2. Set the Low HR alarm to 50 bpm, and High alarm to 120 bpm.
3. Increase the HR to 125 and verify the following:
   a. The middle or high alarm violates with an audio tone and yellow or red LED on the front panel.
   b. Mute the alarm by selecting the **Silence All** key.
   c. Verify that the **Alarm Silenced** message is displayed in the message area and the alarm is silent.
4. Select the **Capture Event** key. Select the **History** button and examine the trend data. The high HR rate should be yellow or red (LCD) indicating the High HR is violated.

5.9.3 IBP 1 and IBP 2 Verification

Tools required:

- Fluke Medsim 300B patient simulator or MPS 450 equivalent recommended
- Dedicated IBP adapter cable

1. Set the simulator to 0 mmHg for both IBP 1 and IBP2.

2. Select the **Zero All IBP** key. Verify the systolic, diastolic and mean values display as 0 ±1mm /Hg.

3. Configure the patient simulator as P (static) = 50 mmHg, the displayed value should be within 50 ± 2 mmHg.

4. Reset the patient simulator as P(static)=150mmHg and 300 mmHg, the displayed value should be within 150 ± 3 mmHg and 300 ± 6 mmHg.

5. Apply a 120/80/mmHg signal into IBP - 1 and apply a 60 / 20/ mmHg signal into IBP 2 and verify that the waveforms are displayed on the screen.

5.9.4 Temperature Verification

Tool required: Resistance box (with accuracy above 0.1 ohm)

1. Connect the two pins of any Temp connector of a module to the two ends of the resistance box using 2 wires.

2. Set the resistance box to 1354.9 ohms (corresponding temperature is 37°C).

3. Verify the temperature is 37° ± 0.1°C.

5.9.5 SpO_2 Verification

Tools required: None

1. Set the display waveform 4 to **Pleth**. Set the HR source to **Auto**.

2. Verify that the SpO_2 message is displaying **SpO_2 No Sensor** in the message area.

3. Connect the SpO_2 sensor to the panel connector. Verify the SpO_2 message changes to Sensor Off or SpO_2 Initializing.

4. Apply sensor to finger (assuming that you stay healthy).

5. Verify SpO_2 displays the pleth waveform, and the SpO_2 indicates a valid reading within 95% through 100%. Verify the HR source is SpO_2 and a beep tone is present.

NOTE: **A functional tester cannot be used ℃ to assess the accuracy of the pulse oximeter probe or a pulse oximeter monitor.**

5.9.6 NIBP Verification

Tools required:

- Manometer
- Bulb valve
- Test chamber
- Tubing
- T-shape connector

1. Connect the equipment as shown in the figure of section "NIBP Calibration" on page 5-16.
2. Select **System** from **Setup** tab. Enter the password (defaulted to SYSTEM and can be changed).
3. Select **Service** tab from **System** menu. Enter the password (defaulted to SERVICE and can be changed).
4. Select **Start** button. The Unit will pump to 250 mmHg. Verify the measured pressure is within 3 mmHg of the manometer.
5. Release pressure with bulb valve and allow the pressure to settle at 0.
6. Close the bulb valve.
7. Before inflation, the reading of the manometer should be 0. If not, open the bulb valve to let the whole airway open to the atmosphere. Close the bulb valve after the reading is 0.
8. Raise the pressure in the test chamber to 50 mmHg with the bulb valve. Then, wait for 10 seconds until the measured values become stable.
9. Compare the manometer values with the monitor values. The difference should be within 3 mmHg.
10. Raise the pressure in the test chamber to 200 mmHg with the bulb valve. Then, wait for 10 seconds until the measured values become stable and repeat Step 9.

5.9.7 RESP Verification

Tool required: Fluke Medsim 300B patient simulator recommended

1. Connect the patient simulator to the module using a non ESU-proof cable.
2. Configure the simulator as follows: lead II to the respiration lead, base impedance line to 1500 ohms, delta impedance to 0.5 ohm, respiration rate to 40 rpm.
3. Check the Resp wave is displayed without any distortion and the displayed Resp value is within 40 ± 2 rpm.

5.9.8 C.O. Verification

Tools required:

- Fluke Medsim 300B patient simulator recommended
- C.O. adapter box

1. Connect the patient simulator to the C.O. module using a C.O. cable.
2. Set the blood temperature (TB) to 37°C on the patient simulator and check the temperature value is 37 ± 0.1°C.
3. Set **Auto start** to **Off** and adjust **Computational Constant** to **0.595** on the patient monitor.

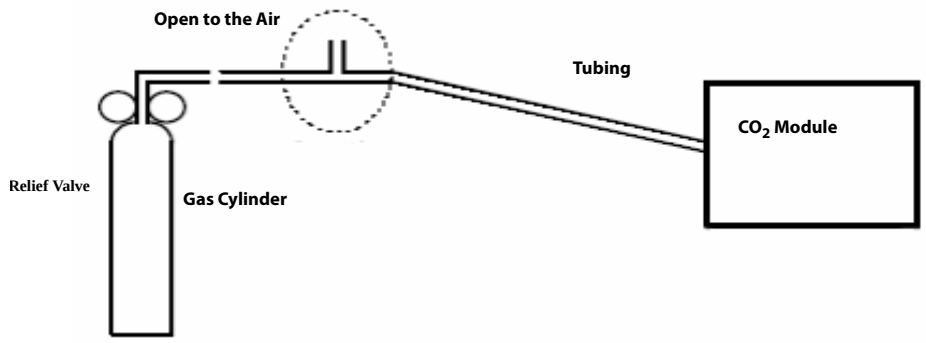
4. Set the injectate temperature to 24°C and C.O. to 5L/min on the C.O. simulator. Select **Start CO** in the C.O. measurement window to start C.O. measurement and after 3-10 seconds select the **run** key on the simulator.
5. Check that the C.O. value displayed on the patient monitor is 5±0.25L/min.

5.9.9 CO_2 Operation Verification

Tools required:

- Gas cylinder with calibration gas (P/N 0075-00-0033-01)
- T-shape connector
- Tubing

1. Connect the gas cylinder with the tubing using a T- connector as follows. Check the airway and make sure there are no leaks.



2. Open and then close the relief valve alternately at the interval of 2 to 3 seconds, and make sure that there is an excess gas flow through the T-shape connector to air when the relief valve is open.
3. Check the displayed CO_2 value is within 5±0.3%.

5.9.10 Battery Operation Verification

1. Remove batteries if they are installed in the unit.
2. Verify the unit functions on line power correctly.
3. Install the three batteries in the appropriate slots located on the left side of the monitor.
4. Remove the line cord from the unit. Verify the unit operation is not interrupted.

5.9.11 Network Print Test

Tools required:

- Hub
- Network cable

1. Connect the patient monitor and network printer to a hub using a common network cable.
2. Set IP address as follows: Select **Setup** from **System** menu, enter the required password (SYSTEM or the password you configured), select **IP Address** and then select **Printer >>**.

NOTE: See the instructions for use accompanying the printer.

3. Set the IP address of the patient monitor to the IP of the network printer in the same network segment: Select **Setup** from **System >>**, enter the required password, and select **Network >>** from **Wired.**
4. Enter the Demo mode of the patient monitor: Select **Setup** from **System >>**, enter the required password, select **System >>** from **Demo Mode>>**, and then select **Enable** and select **Accept**.
5. Select **Print** and then select **Print 12-Lead**. The network printer shall print out the report correctly.

5.9.12 VDI Test

Tools required: None

1. Connect the patient monitor and Vigilance by the serial cable recommended in the operating instructions.
2. Set HEMO, SvO_2 and CCO to display on monitor as follows: Select **Display** from **Setup,** and then select **Display Setup**.
3. Set the Vigilance to DEMO mode. Start the measurement of HEMO ,SvO_2 and CCO in the DEMO mode.
4. Verify that the value of the HEMO, SvO_2 and CCO in monitor is the same as the value showed in Vigilance.

5.9.13 Recorder Test

Tools required:

- Fluke Medsim 300B patient simulator recommended

1. Use an ECG simulator (with Fluke Medsim 300B patient simulator recommended)and connect an ECG cable to the VPS. Set the ECG simulator to 60 bpms, 1mv QRS signal.
2. Print "ECG I" as follows: Select **Print Setup** from **Print**, and then select **Setup** and **Configure Waveforms**. Select ECG I to print.
3. Select **Strip**. Recorder shall print the waveform normally.
4. Set the alarm limit of HR and Resp. Let the patient monitor run in alarm status.
5. Select **Strip**. Recorder shall print the corresponding alarm information.

5.9.14 Electrical Safety Tests

WARNING: Electrical safety tests are a proven means of verifying the electrical safety of the patient monitor. They are intended for determining potential electrical hazards. Failure to find out these hazards timely may cause personnel injury.

WARNING: Commercially available test equipment such as safety analyzer, etc. can be used for electrical safety tests. Be sure that the test equipment can be safely and reliably used with the patient monitor before use. The service personnel should acquaint themselves with the use of the test equipment.

WARNING: Electrical safety tests should meet the requirements of the new edition of standards EN 60601-1 and UL60601.

WARNING: These electrical safety tests do not supersede local requirements.

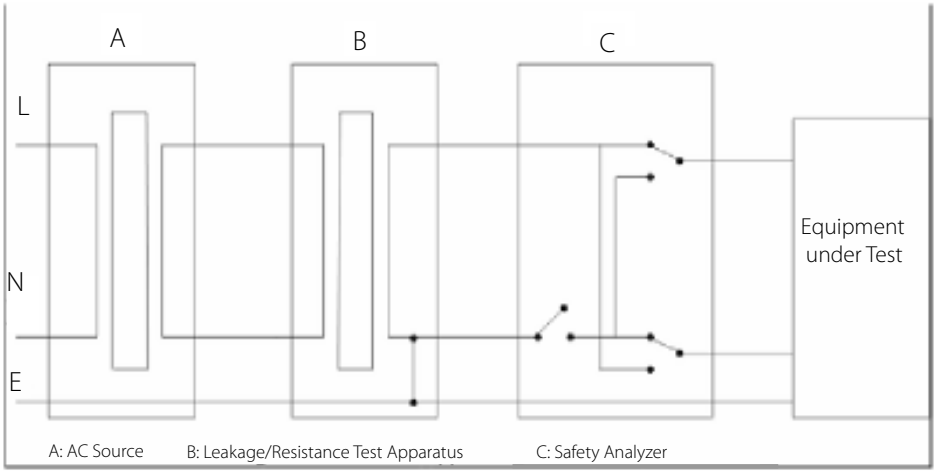
WARNING: All devices using the AC mains and connected to medical equipment within patient environments must meet the requirements of the IEC 60601-1 medical electrical systems standard and should be put under electrical safety tests at the frequency recommended for the patient monitor.

Electrical safety tests are intended to check if potential electrical hazards are imposed on the patient, operator or service personnel of the equipment.

Electrical safety test should be performed under normal ambient conditions of temperature, humidity and pressure.

The electrical safety test plan described hereafter takes 601 safety analyzer as an example. Different safety analyzers may be used in different areas. Be sure to choose applicable test plan.

Connection of the equipment is shown below:



Tools required:

- Safety analyzer
- Isolation transformer

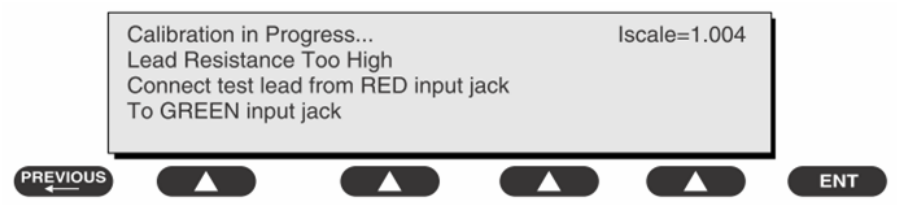
5.9.14.1 Protective Earth Resistance

Protective Earth Resistance is measured using the RED test lead attached to the DUT Protective Earth terminal or enclosure. Select the test current by selecting SOFT KEY 3 to toggle between 1AMP, 10AMP, and 25AMP. The front panel outlet power is turned off for this test.

The following conditions apply: L1 and L2 Open.

Preparation

1. First select the test current that will be used for performing the protective earth resistance test by selecting **AMPERES** (SOFT KEY 3).
2. Connect the test lead(s) between the RED input jack and the GREEN input jack.
3. Select CAL LEADS. The 601PRO will measure the lead resistance, and if less than 0.150 Ohms, it will store the reading and subtract it from all earth resistance readings taken at the calibrated current.

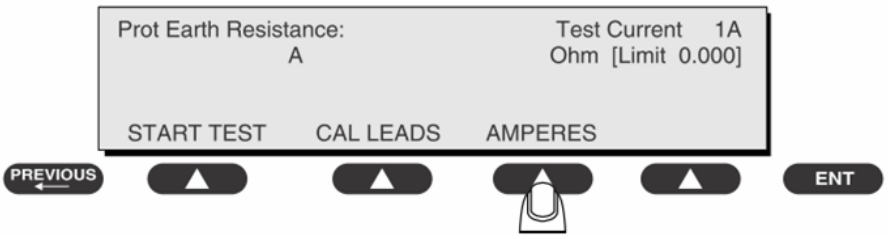


If the calibration fails, the previously stored readings will be used until a passing calibration has occurred.

WARNING: During Earth Resistance testing, the DUT must be plugged into the 601PRO front outlet. If the DUT fails Earth Resistance, discontinue tests and label the device defective.

To Perform the Test

1. From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet.
2. Attach the 601PRO RED input lead to the device's Protective Earth terminal or an exposed metal area.
3. Select shortcut key 3. The Protective Earth Resistance test is displayed.
4. Select SOFT KEY 3 to select a test current (1AMP, 10AMP, or 25AMP). The selected test current is displayed in the upper right corner of the display.



5. Select START TEST to start the test. The test current is applied while resistance and current readings are taken. This takes approximately 5 seconds.

6. Select the print data key at any time to generate a printout of the latest measurement(s).

NOTE: **When "Over" is displayed for Ohms, this signifies that a valid measurement was not obtained because either an open connection was detected or that the measurement was not within range. Readings greater than 9.999 Ohms will be displayed as Over.**

In Case of Failure

Once it reaches the limitation, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

ALL COUNTRIES R = 0.2 ohm Maximum

5.9.14.2 Earth Leakage Test

Run an Earth Leakage test on the device being tested before performing any other leakage tests.

Leakage current is measured the following ways:

- Earth Leakage Current, leakage current measured through DUT outlet Earth
- Earth Leakage Current AP-EARTH (ALL Applied Parts connected to Earth), leakage current measured through DUT outlet Earth

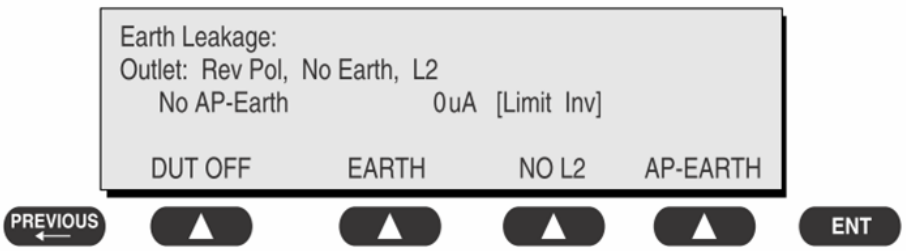
There is no need to attach a test lead; the 601PRO automatically connects the measuring device internally.

To Perform the Test

1. From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.

2. Attach the device's applied parts to the 601PRO applied part terminals if applicable.

3. Select shortcut key 4.The Earth Leakage test appears on the display, and the test begins immediately:



- SOFT KEY 1 toggles the DUT outlet Polarity from Normal to Off to Reverse.
- SOFT KEY 2 toggles the DUT outlet from Earth to No Earth.
- SOFT KEY 3 toggles the DUT outlet from L2 to No L2.
- SOFT KEY 4 toggles the AP to Earth to No AP to Earth.

4. Select the print data key at any time to generate a printout of the latest measurement.

In Case of Failure

- Check any broken of the enclosure. Replace any defective part.
- Inspect wiring for bad crimps, poor connections, or damage.
- Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.
- Change another probe to confirm if the fail is caused by console.
- Inspect wiring for bad crimps, poor connections, or damage.
- If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.
- If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

USA:

- 300 µA Normal Condition
- 1000 µA Single Fault Condition

OTHER COUNTRIES:

- 500 µA Normal Condition
- 1000 µA Single Fault Condition

5.9.14.3 Patient Leakage Current

Patient leakage currents are measured between a selected applied part and mains earth. All measurements may have either a true RMS or a DC-only response.

Preparation

Perform a calibration from the Mains on Applied Part menu.

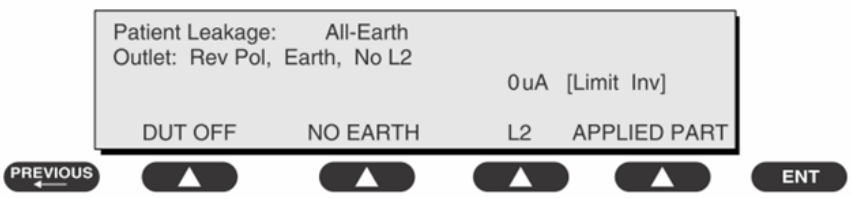
The following outlet conditions apply when performing this test:

- Normal Polarity, Earth Open, Outlet ON Normal Polarity, Outlet ON
- Normal Polarity, L2 Open, Outlet ON Reversed Polarity, Outlet ON
- Reversed Polarity, Earth Open, Outlet ON Reversed Polarity, L2 Open, Outlet ON

WARNING: If all of the applied parts correspond to the instrument type, the applied parts will be tied together and one reading will be taken. If any of the applied parts differ from the instrument type, all applied parts will be tested individually, based on the type of applied part. This applies to Auto and Step modes only.

To Perform the Test

1. From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.
2. Attach the applied parts to the 601PRO's applied part terminals.
3. Select shortcut key 6. The Patient Leakage test is displayed, and the test begins immediately.



4. Select APPLIED PART (SOFT KEY 4) at any time to select the desired applied part leakage current.
5. Modify the configuration of the front panel outlet by selecting the appropriate SOFT KEY on the 601PRO.
6. Select the print data key at any time to generate a printout of the latest measurement.

WARNING: If the current test standard being used does not include Patient Leakage DC readings, or the DC option is not enabled, then DC readings will not be available through the APPLIED PART SOFT KEY selections. Refer to Chapter 8, Standards and Principles.

In Case of Failure

- Check any broken of the enclosure. Replace any defective part.
- Inspect wiring for bad crimps, poor connections, or damage.
- Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.
- Change another probe to confirm if the fail is caused by console.
- Inspect wiring for bad crimps, poor connections, or damage.
- If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.
- If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

For CF applied parts

- 10µA Normal Condition
- 50µA Single Fault Condition

For BF applied part

- 100µA Normal Condition
- 500µA Single Fault Condition

5.9.14.4 Mains on Applied Part Leakage

The Mains on Applied Part test applies a test voltage, which is 110% of the mains voltage, through a limiting resistance, to selected applied part terminals. Current measurements are then taken between the selected applied part and earth. Measurements are taken with the test voltage (110% of mains) to applied parts in the normal and reverse polarity conditions as indicated on the display.

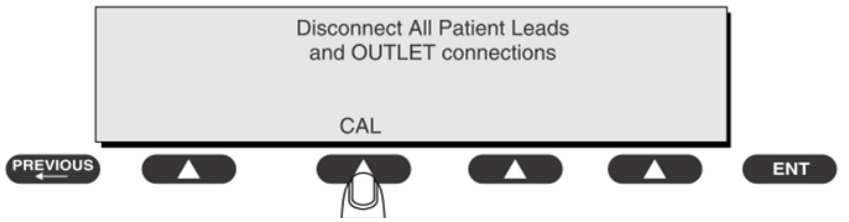
The following outlet conditions apply when performing the Mains on Applied Part test.

- Normal Polarity;
- Reversed Polarity

Preparation

To perform a calibration from the Mains on Applied Part test

1. Select CAL (SOFT KEY 2).
2. Disconnect ALL patient leads, test leads, and DUT outlet connections.
3. Select CAL to begin calibration, as shown:



If the calibration fails, the previously stored readings will be used until a passing calibration has occurred. Also, the esc/stop key has no effect during calibration.

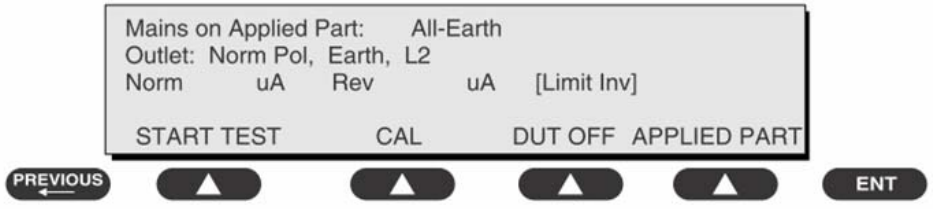
4. When the calibration is finished, the Mains on Applied Part test will reappear.

WARNING: A 2-beep-per-second signal indicates high voltage present at the applied part terminals while a calibration is being performed.

WARNING: High voltage is present at applied part terminals while measurements are being taken.

To Perform the Test

1. From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601
2. Attach the applied parts to the 601PRO applied part terminals.
3. Attach the red terminal lead to a conductive part on the DUT enclosure.
4. Select shortcut key 7. The Mains on Applied Part test is displayed.


Mains on Applied Part: All-Earth
Outlet: Norm Pol, Earth, L2
Norm uA Rev uA [Limit Inv]
START TEST CAL DUT OFF APPLIED PART
PREVIOUS
ENT

5. Select the desired outlet configuration and applied part to test using the appropriate SOFT KEYS:
6. Select START TEST (SOFT KEY 1) to begin the test.
7. Select the print data key to generate a printout of the latest measurement.

WARNING: If all of the applied parts correspond to the instrument type, the applied parts will be tied together and one reading will be taken. If any of the applied parts differ from the instrument type, all applied parts will be tested individually, based on the type of applied part. This applies to Auto and Step modes only.

In Case of Failure

- Check any broken of the enclosure. Replace any defective part.
- Inspect wiring for bad crimps, poor connections, or damage.
- Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.
- Change another probe to confirm if the fail is caused by console.
- Inspect wiring for bad crimps, poor connections, or damage.
- If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.
- If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

For CF applied parts

50µA

For BF applied parts

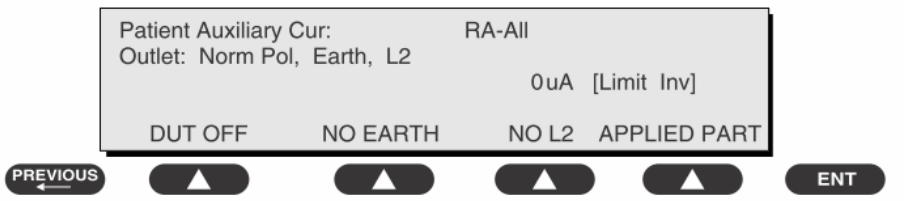
5000µA

5.9.14.5 Patient Auxiliary Current

Patient Auxiliary currents are measured between any selected ECG jack and the remaining selected ECG jacks. All measurements may have either a true RMS or a DC-only response.

Preparation

1. From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.
2. Attach the patient leads to the 601PRO ECG jacks.
3. Define the Lead Types from the View Settings Option (refer to: Lead Type Definitions in Section 5 of this chapter).
4. Select shortcut key 8. The Patient Auxiliary Current test is displayed, and the test begins immediately. Display values are continuously updated until another test is selected.



5. Select SOFT KEYS 1-4 to select leakage tests
6. Select APPLIED PART (SOFT KEY 4) at any time to select the desired applied part leakage current:
7. Modify the configuration of the front panel outlet by selecting the appropriate SOFT KEY on the 601PRO:
8. Select the print data key at any time to generate a printout of the latest measurement.

NOTE: **If the current test standard being used does not include Patient Auxiliary Current DC readings, or the DC option is not enabled, then DC readings will not be available through the APPLIED PART SOFT KEY selections.**

In Case of Failure

- Check any broken of the enclosure. Replace any defective part.
- Inspect wiring for bad crimps, poor connections, or damage.
- Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.
- Change another probe to confirm if the fail is caused by console.
- Inspect wiring for bad crimps, poor connections, or damage.
- If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.
- If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

For CF applied parts

- 10µA Normal Condition
- 50µA Single Fault Condition

For BF applied part

- 100µA Normal Condition
- 500µA Single Fault Condition

6.0 *Maintenance*

6.1 User Maintenance Introduction

This section of the manual outlines routine user maintenance guidelines.

The **V Series** Patient Monitor is designed for stable operation over long periods of time. Under normal circumstances the monitor should not require technical maintenance beyond that described in this section. However, routine maintenance, calibration and safety checks are recommended at least once a year or more often as required by local statutory or hospital administration practice.

6.2 Maintenance Schedule

The following is a list of activities required for periodic maintenance of the **V Series** Patient Monitor. The physical inspection, replacement of consumable items and performance checks should be performed at the recommended intervals stated below.

Mindray is not responsible for component failure or loss resulting from the use of stated consumable items beyond their recommended replacement interval.

SUGGESTED MAINTENANCE TIMETABLE	FREQUENCY
Preventative Maintenance Tests	**Required**
Mechanical/Physical/Visual inspection	Once per year
NIBP calibration	Once per year If relevant performance test fails Following any repairs or replacement of relevant module
Microstream® CO_2 calibration	
Microstream® CO_2 leakage test	
Performance Tests	**Required**
ECG performance	If the user suspects that the measurement is incorrect. Following any repairs or replacement of relevant module. At least once every two years Note: At least once a year is recommended for NIBP and CO_2 modules.
Resp performance	
NIBP performance	
IBP performance	
SpO_2 performance	
Temperature performance	
CO_2 performance	
C.O. performance	
VDI performance	
Recorder performance	
Electrical Safety Tests	**Required**
Protective earth resistance test	Once every two years Following any opened repair type
Earth leakage test	Once every two years Following any opened repair type with modifying the power board
Patient leakage current test	Once every two years Following any opened repair type with modifying the power board or patient circuit board
Mains on applied part leakage	Once every two years Following any opened repair type with modifying the power board or patient circuit board
Patient auxiliary current test	Once every two years Following any opened repair type with modifying the power board or patient circuit board
Other Tests	**Required**
Power on test	When first installed or reinstalled Following any replacement of any main unit parts
Touchscreen calibration	When the touchscreen appears abnormal After the touchscreen is replaced

SUGGESTED MAINTENANCE TIMETABLE	FREQUENCY
Battery check	When first installed Whenever a battery is replaced
Network print test	When first installed Whenever the printer is serviced or replaced

6.2.1 Mechanical/Physical/Visual Inspection

1. Inspect outercase, line cords, rolling stands, wall mounts, modular accessories and interconnecting cables.
2. Inspect patient interface connections (ECG, IBP, SpO_2, Temp, CO_2 and NIBP).

6.2.2 Perform NIBP Verification and Calibration

1. Perform NIBP test. See “NIBP Verification” on page 5-24.
2. Perform NIBP calibration. See “NIBP Calibration” on page 5-16.

6.2.3 Perform CO_2 Verification and Calibration

1. Perform CO_2 test. See “CO2 Operation Verification” on page 5-25.
2. Perform Microstream® CO_2 calibration. See “Microstream® CO2 Calibration” on page 5-18.
3. Perform Microstream® CO_2 leakage test. See “Microstream® CO2 Leakage Test” on page 5-19.

6.2.4 Perform ECG Verification

- Perform ECG test. See “ECG Tests” on page 5-22.

6.2.5 Perform RESP Verification

- Perform RESP test. See “RESP Verification” on page 5-24.

6.2.6 Perform IBP Verification

- Perform IBP test. See “IBP 1 and IBP 2 Verification” on page 5-23.

6.2.7 Perform SpO_2 Verification

- Perform SpO_2 test. See “SpO2 Verification” on page 5-23.

6.2.8 Perform Temperature Verification

- Perform temperature test. See “Temperature Verification” on page 5-23.

6.2.9 Perform C.O. Verification

- Perform C.O. test. See “C.O. Verification” on page 5-24.

6.2.10 Perform VDI Verification

- Perform VDI test. See “VDI Test” on page 5-26.

6.2.11 Perform Recorder Verification

- Perform recorder test. See “Recorder Test” on page 5-26.

6.2.12 Perform Electrical Safety Tests

1. Perform protective earth resistance test. See “Protective Earth Resistance” on page 5-28.
2. Perform earth leakage test. See “Earth Leakage Test” on page 5-29.
3. Perform patient leakage current test. See “Patient Leakage Current” on page 5-30.
4. Perform mains on applied part leakage test. See “Mains on Applied Part Leakage” on page 5-32.
5. Perform patient auxiliary current test. See “Patient Auxiliary Current” on page 5-33.

6.2.13 Perform Touchscreen Calibration

- Perform touchscreen calibration. See “Touchscreen Calibration” on page 5-20.

6.2.14 Perform Battery Verification

- Perform battery operation verification. See “Battery Operation Verification” on page 5-25.

6.2.15 Perform Network Print Test

- Perform network print test. See “Network Print Test” on page 5-26.

6.3 Care and Cleaning of the Monitor

NOTE: Only use the following approved cleaning solutions. System may become inoperable or halted because of contamination or damage caused by use of unapproved cleaning solution. chlorinated hydrocarbon.

Clean with a lint-free cloth, moistened with warm water (40°C/104°F maximum) and soap, diluted in any of the approved cleaning solutions.

- 70% isopropyl alcohol
- 90% isopropyl alcohol
- 10% sodium hypocholride (bleach) solution
- Water
- Virkon
- Super Sani-cloth (0.5% Quaternary ammonium chloride and 55% Isopropyl alcohol)

Apply cleaning solution to the cloth, not directly onto the monitor. DO NOT apply large amounts of liquid. DO NOT use abrasive cleaning agents or organic solvents.

To prevent scratches on the screen carefully brush dust and dirt particles with a soft sponge moistened with cleaning solution or a fine, soft-hair brush. DO NOT use abrasive cleaning materials such as acetone or trichloroethylene. Remove fingerprints and stains with a liquid lens cleaner and a soft cloth. DO NOT wipe a dry screen or use alcohol or solvents containing chlorinated hydrocarbon.

Take extra care when cleaning the monitor screen because it is more sensitive to rough cleaning methods than the housing. Do not permit any liquid to enter the monitor case and avoid pouring it on the monitor while cleaning. Do no allow water or cleaning solution to enter the measurement connectors. Wipe around, not over, connector sockets.

6.4 Decontamination of the Monitor

WARNING: Perform the decontamination process with the unit powered down and power cord removed.

Decontamination of a unit that has come in contact with a biological material can be performed using LpH SE Germicidal detergent. Apply a small amount of detergent to a disposable wipe (paper based) and wipe down the outside of the unit. Discard the wipe appropriately. After waiting 10 minutes, use a clean dry wipe to dry the unit.

CAUTION: During the decontamination process, do not get the LpH SE Germicidal detergent into any vent openings.

6.5 Care and Cleaning of SpO_2 Sensors

NOTE: Refer to the individual instruction sheets that are packaged with each sensor.

- Check sensors and cables daily for signs of damage. Replace as required.
- Sensors should be cleaned before and after each new patient.
- Wipe the patient contact area using a soft cloth with mild soap and water solution or isopropyl alcohol. Hydrogen peroxide can be used to remove dried blood.
- Allow the sensor to completely dry before using.

CAUTION: When cleaning sensors, do not use excessive amounts of liquid. Wipe the sensor surface with a soft cloth, dampened with cleaning solution. Do not attempt to sterilize.

Cleaning and Re-use of a Nellcor® Sensor

Sensors may be reattached to the same patient if the emitter and detector windows are clear and the adhesive still adheres to the skin. The adhesive can be partially rejuvenated by wiping with an alcohol wipe and allowing the sensor to thoroughly air dry prior to replacement on the patient.

Do not immerse any Oxisensor®, OxiMax®, Durasensor®, Oxiband®, or Duraform® oxygen transducers, the Nellcor® RS-10 or Max-Fast® oxygen transducers, or any Nellcor® adhesive in water or cleaning solution. Clean Durasensor®, Oxiband®, and Duraform? oxygen transducers, and the Nellcor® RS-10 or Max-Fast® oxygen transducers by wiping with a disinfectant such as a solution containing 70% alcohol. Do not sterilize by irradiation, steam, or ethylene oxide. Use a new Oxiband® adhesive wrap or FORM-A adhesive bandage for each patient. Do not re-sterilize Oxisensor® or OxiMax®oxygen transducers.

6.6 Care and Cleaning of Reusable Temperature Probes

NOTE: Refer to the individual instruction sheets that are packaged with each temperature probe for additional information.

- Check temperature probes and cables daily for signs of damage. Replace as required.
- Clean the probes before and after each new patient.
- Wipe the patient contact area using a soft cloth with mild soap and water solution or isopropyl alcohol.
- Allow the probe to completely dry before using.

6.7 Cleaning CO_2 Sensors, Adapters and Sampling Components

Oridion CO_2 patient monitoring accessories are designed for single patient use and should not be cleaned or reused.

6.8 Sterilization and Cleaning of Cuffs

6.8.1 Reusable Cuffs with Bladders

Remove the bladder from the cuff before cleaning and disinfecting the cuff.

Cleaning

Hand or machine wash the cuff in warm water or with mild detergent. Clean the bladder with a damp cloth. Air dry the cuff thoroughly after washing.

NOTE: Machine washing may shorten the service life of the cuff.

Disinfection

Disinfect the cuff with a cloth dampened in 70% isopropanol or with ultraviolet. Also clean the bladder with ultraviolet.

NOTE: Prolonged use of disinfectant may cause discoloration of the cuff.

Replace the bladder after cleaning and disinfecting the cuff:

1. Place the bladder on the top of the cuff, as shown in FIGURE 6-1.
2. Roll the bladder lengthwise and insert it into the large opening, as shown in FIGURE 6-1.
3. Hold the hose and the cuff and shake the complete cuff until the bladder is in position.
4. Thread the hose from inside the cuff, and out through the small hole under the internal flap.

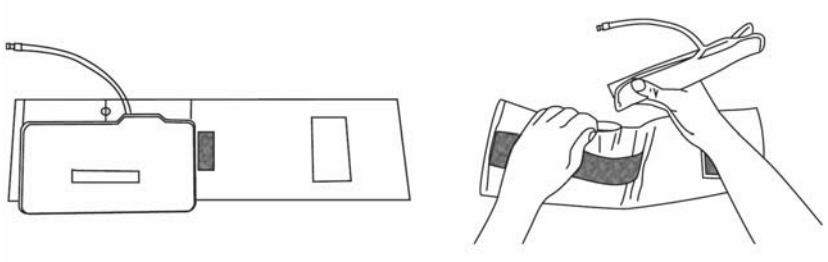


FIGURE 6-1 Example NIBP Cuff

CAUTION: Clean and disinfect the cuff according to the instructions.

CAUTION: Do not dry clean the cuff.

CAUTION: Do not press the cuff with a hot iron.

CAUTION: Do not clean with detergent or disinfectant.

CAUTION: Disinfect the bladder with 70% isopropanol or ultraviolet.

6.8.2 Disposable Blood Pressure Cuffs

Disposable cuffs are intended for single patient use only. Once a cuff is used on a patient it should be discarded. Do not use the same cuff on any other patient. Do not sterilize or use an autoclave on disposable cuffs.

CAUTION: Disposable cuffs can be cleaned using a mild soap solution and dried with a clean cloth.

6.9 Care and Cleaning of ECG Cables and Lead wires

Use the same approved cleaning solutions outlined in the "Care and Cleaning of the Monitor" on page 6-5.

After cleaning, the ECG cables and lead wires should be wiped with water using a clean damp cloth then dried with a clean dry cloth. The ECG cables and lead wires must be allowed to dry thoroughly before use.

NOTE: ECG cables and lead wires must never be immersed, soaked in any fluids, and they should not be cleaned with harsh chemicals such as acetone or non-diluted bleach.

NOTE: Do not autoclave, radiation or steam sterilize ECG cables or lead wires.

NOTE: Extended exposure to Ethylene Oxide gas may shorten life.

6.10 Battery Replacement and Maintenance

6.10.1 Battery Replacement

1. Open battery compartment door, on left side of unit, by pressing the finger grip area and sliding the door to the rear.
2. Slide the release located at the top of the installed battery. This ejects the battery. Slide out and remove battery.
3. Slide in replacement battery until it clicks into place.
4. Close battery compartment door by sliding the door to the right until it firmly clicks into place.

CAUTION: Replace li-ion batteries with P/N 0146-00-0091-01 ONLY.

6.10.2 Battery Maintenance

The batteries may be subject to local regulations regarding disposal. At the end of the battery life, dispose of the batteries in accordance with any local regulations.

NOTE: V 12 batteries may only be charged within a V 12 monitor. Do not attempt to use commercial rechargers.

NOTE: Remove the batteries if the V 12 is not likely to be used for an extended period of time.

Storage of the li-ion batteries depends on temperature, time period and the degree of cell charging state. After 6 months of storage at 23°C, fully charged li-ion batteries have a remaining capacity of 93%.

6.10.3 Serial Number of Li-ion Battery

Each li-ion battery has a unique serial number (S/N) DS04A9006YYMM$X_1X_2X_3X_4X_5$ as shown in FIGURE 6-2.

FIGURE 6-2 Li-ion Battery Serial Number

DS04A9006 indicates the battery model and is unchanged.

YY indicates the year of manufacture.

MM indicates the week of manufacture.

$X_1X_2X_3X_4X_5$ indicates the production serial number and starts from 00001.

6.10.4 Specification for Internal Battery Replacement (P/N 801-DA6K-00026-00)

Use the following Internal Battery Single Cell li-ion

- Sanyo UR 18650W 3.7 Volts, 1500 mAh
- Specs - cycle life 500 cycles at 25 degrees C = 92%, 700 cycles at 25 degrees C = 82%
- Shelf life of 10 years

6.10.5 Specification for Coin Battery on Carrier Board

Use the following coin battery

- CR2340 3 Volt li-ion, 290 mAh
- Specs - cycle life is 300 cycles at 25 degrees C = 90%
- Shelf life of 10 years
- Replacement cycle (typical) is 8 to 10 years

6.11 Local Recorder Maintenance

6.11.1 Cleaning the Local Recorder Printhead

After prolonged use, deposits of paper debris may collect on the printhead compromising the print quality and shortening the life of the roller. Follow this procedure to clean the printhead:

1. Take measures against static electricity such as wearing a Disposable Wrist Strap for the work.
2. Open the local recorder door and remove the paper.
3. Gently wipe around the printhead using cotton swabs dampened with alcohol.
4. After the alcohol is completely dried, reload the paper and close the local recorder door.

CAUTION: Do not use anything that may destroy the thermal element.

CAUTION: Do not add unnecessary force to the thermal head.

6.11.2 Local Recorder Paper Replacement

The instructions below describe the replacement of local recorder paper. Use only recommended thermal paper. This ensures that the print quality is acceptable and reduces print head wear.

1. Use the latch at the upper right corner of the local recorder door to pull the door open.
2. Remove the empty paper spool.
3. Insert a new paper roll so that it fits snugly into its housing and the sensitive side of the paper faces the print head at the top of the local recorder (paper feeding off of the spool from the bottom).
4. Pull out approximately 4 inches of paper.
5. Align the paper across the top of the roller.
6. Holding the paper in place, close the local recorder door.
7. To ensure that the paper is aligned properly and has not been pinched in the door, pull the loose edge out a couple of inches. If the paper jams, open the door and return to step 5.

CAUTION: Never pull the local recorder paper with force when a recording is in process because it may cause damage to the local recorder.

CAUTION: Do not leave the local recorder door open unless reloading paper or troubleshooting an issue.

6.11.3 Care and Storage of Thermal Chart Paper

Thermal chart paper is chemically treated and the permanency of a recording is affected by storage and handling conditions. The following storage conditions are recommended:

- **Ultraviolet Light**

  Store the recordings in a filing cabinet within a few days of printing. Long term exposure to natural or artificial U.V. sources is detrimental.

- **Storage Temperature and Humidity**

  Keep the recordings in a cool and dry area for a longer lasting image. Extreme temperature and humidity (above 80° F/26° C and 80% humidity) should be avoided.

- **Solvent Reactions**

  Do not store the recordings in plastic bags, acetate sheet protectors, or similar items made from petroleum products. These products emit a small amount of vapor which will, over a period of time, deteriorate the image on the chart paper.

- **Adhesive Tape**

  Never place adhesive tape over recordings. The reaction between the adhesive compound and the chemical/thermal paper can destroy the image within hours.

- **Archives**

  If long term archives are required, make a photocopy of the recordings as back-up. Under normal office filing conditions, the recordings should retain acceptable image quality for about five years.

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7.0 Installation Guide

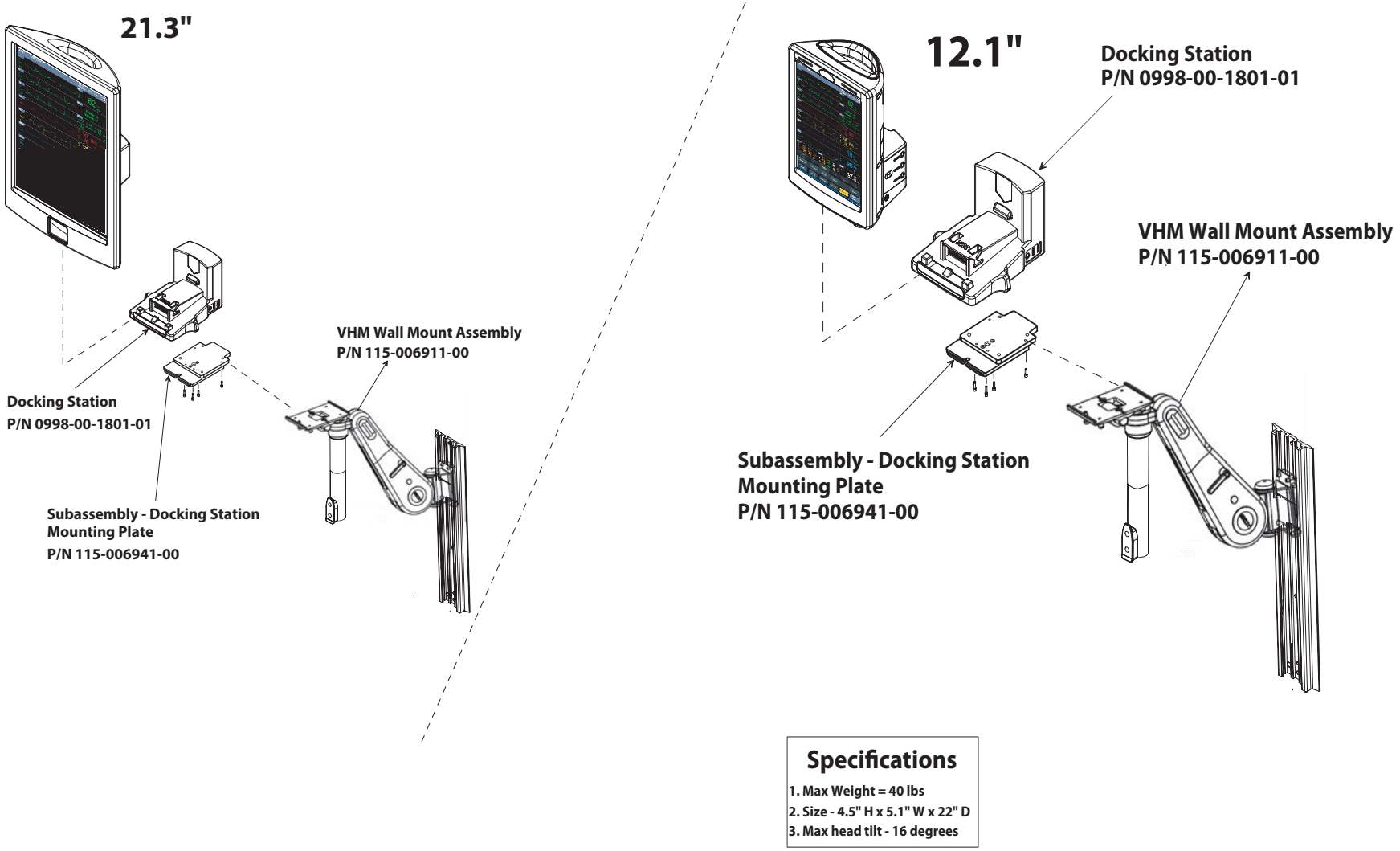
7.1 Installing V Dock

V Dock package shown in FIGURE 7-1 consists of a docking station unit and an AC power cord. V Dock can be placed on a desktop directly or be mounted on a wall mount or rolling stand.

FIGURE 7-1 V Dock Package

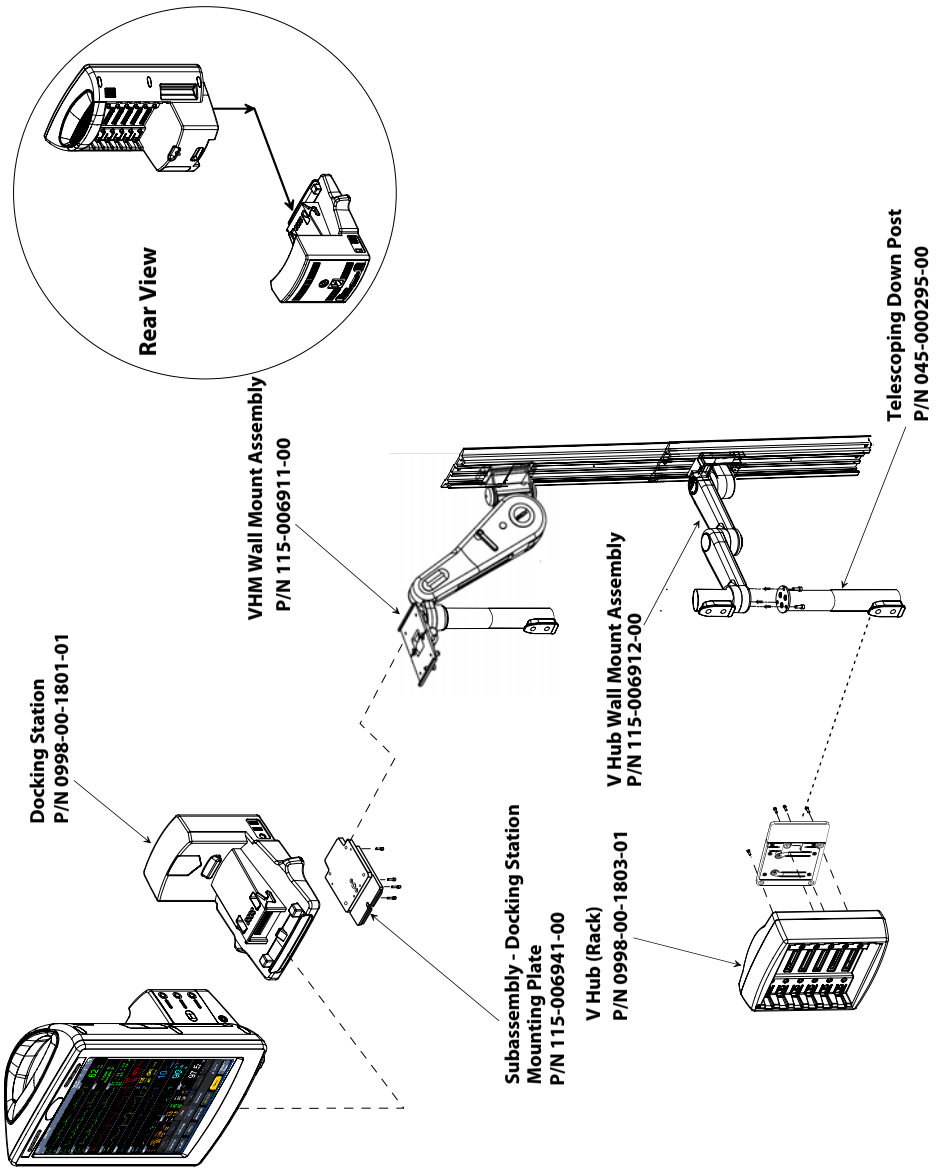
7.2 Mounting V Dock to a Wall Mount

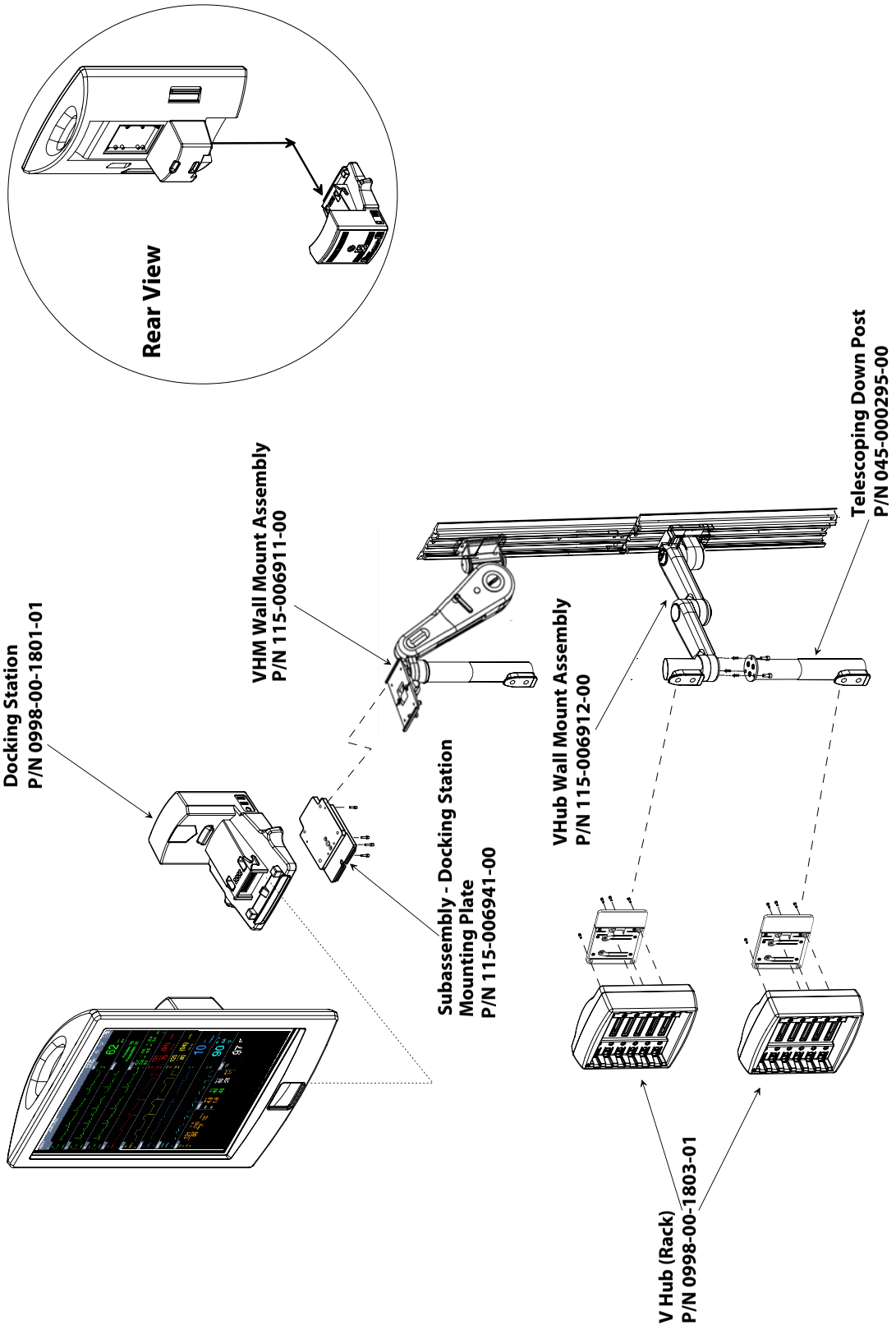
V Series Wall Mount



Specifications

1. Max Weight = 40 lbs
2. Size - 4.5" H x 5.1" W x 22" D
3. Max head tilt - 16 degrees


Rear View
VHM Wall Mount Assembly
P/N 115-006911-00
Telescoping Down Post
P/N 045-000295-00
V Hub Wall Mount Assembly
P/N 115-006912-00
Docking Station
P/N 0998-00-1801-01
Subassembly - Docking Station
Mounting Plate
P/N 115-006941-00
V Hub (Rack)
P/N 0998-00-1803-01


Rear View
VHM Wall Mount Assembly
P/N 115-006911-00
Telescoping Down Post
P/N 045-000295-00
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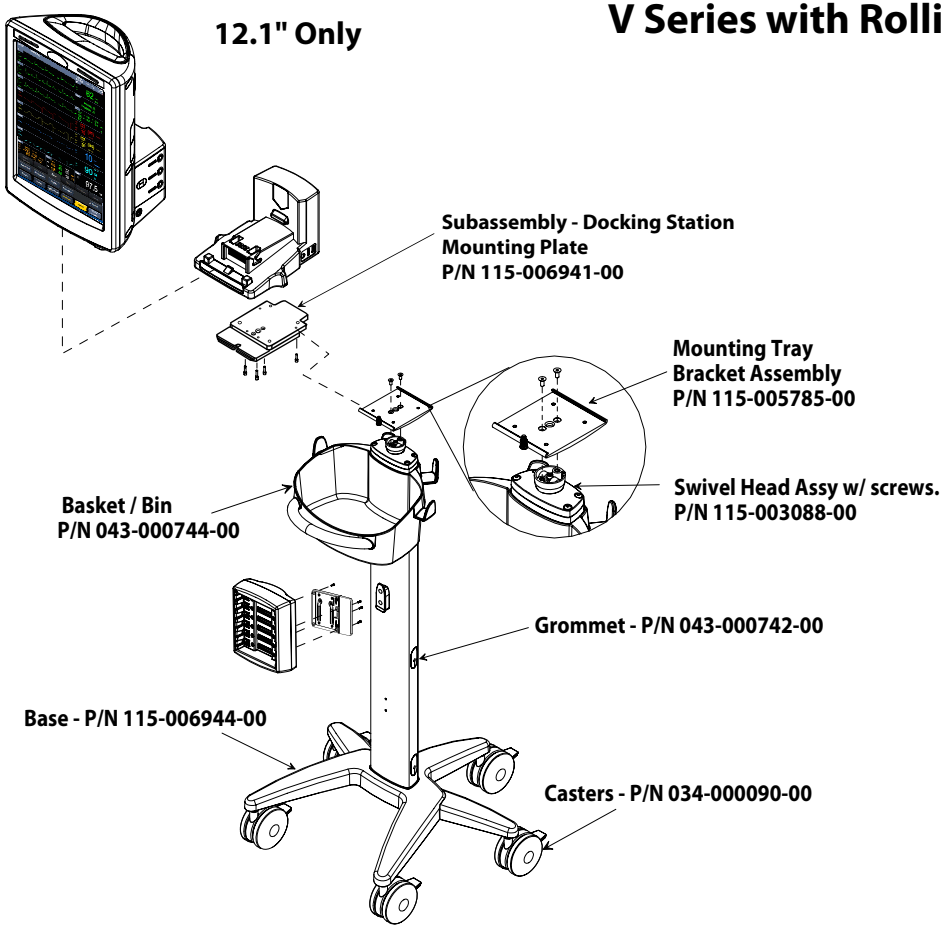
P/N 115-006912-00
Subassembly - Docking Station
Mounting Plate
P/N 115-006941-00
V Hub (Rack)
P/N 0998-00-1803-01

7.3 Mounting V Dock to a Rolling Stand

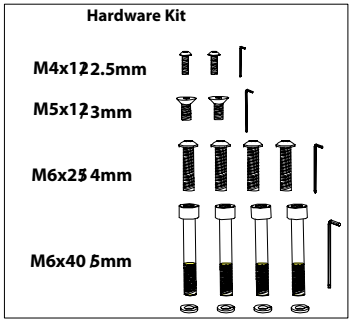
V Series with Rolling Stand



Specifications

1. Max Weight = 35 lbs
2. Size - 47" H x 27" W x 27" D
3. Max head tilt - 10 degrees

Hardware Kit - P/N 115-007069-00



7.4 Installing 12.1" Monitor/21.3" Monitor to V Dock

FIGURE 7-2 shows the 12.1" monitor package. The 12.1" monitor package consists of a 12.1" monitor and three batteries.

FIGURE 7-2 12.1" Monitor Package

FIGURE 7-3 shows the 21.3" monitor package. 21.3" monitor can only be mounted to a wall mount. See Section 7.2 on Page 7-2 through 7-4 for steps of installing 21.3" Monitor.

FIGURE 7-3 21.3" Monitor Package

Installing 12.1" Monitor/21.3" Monitor to V Dock

The 12.1" monitor can be placed on a desktop directly or mounted to V Dock. The 21.3" monitor can only be mounted to a wall mount.

1. Place the monitor onto V Dock, with the pins of the monitor snapped into the slots of V Dock.
2. Push the monitor toward V Dock until it is clicked into place as shown in FIGURE 7-4.

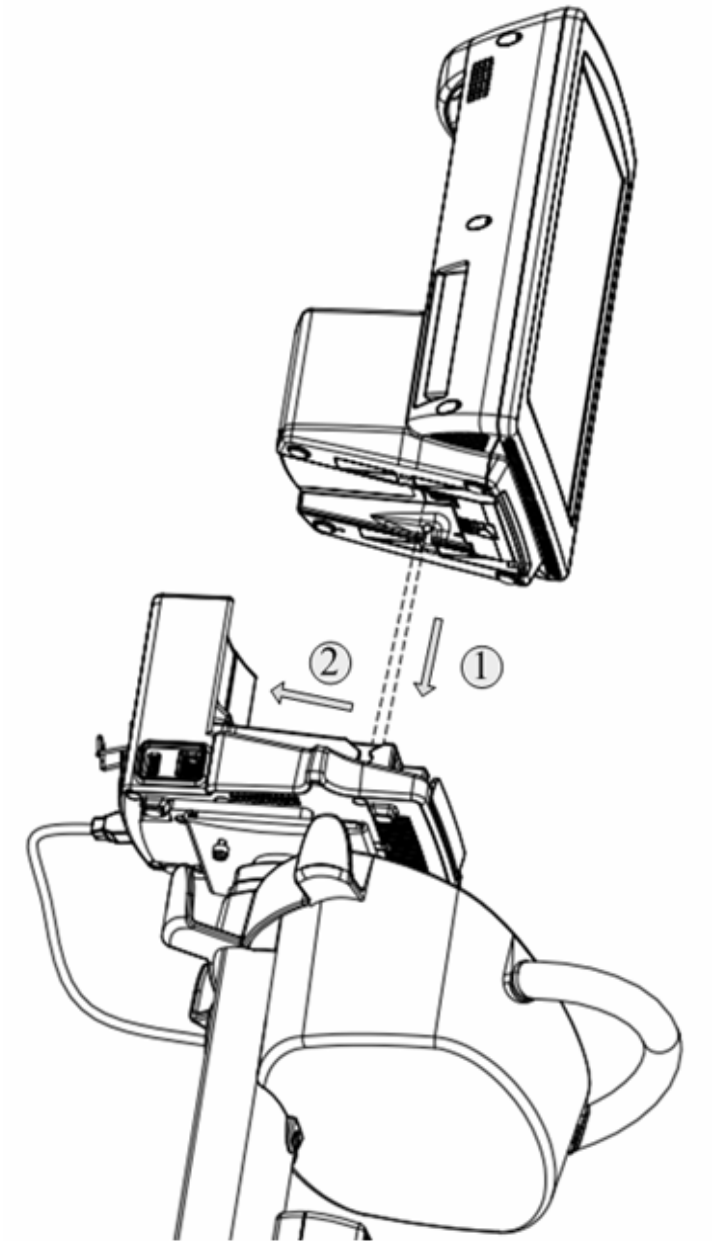


FIGURE 7-4 Installing the Monitor to V Dock

7.5 Installing V Hub

FIGURE 7-5 shows the V Hub package. The V Hub package consists of a V Hub unit and a PUSB cable .

FIGURE 7-5 V Hub Package

V Hub can be mounted to a rolling stand and wall mount.

Installing a V Hub to a Rolling stand

1. Install a V Hub to a rolling stand as shown in FIGURE 7-6.
2. Plug the PUSB cable from the V Hub to the V Dock, 12.1" monitor or 21.3" monitor (if there is any).

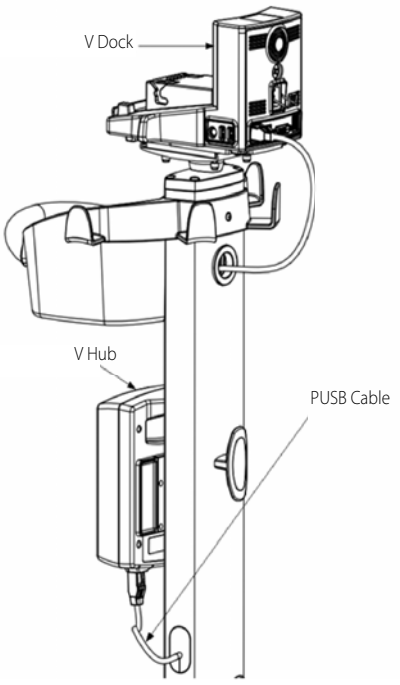


FIGURE 7-6 Installing a V Hub to a Rolling Stand

8.0 *Warranty*

8.1 Warranty Statements

Mindray warrants that components within the monitor unit will be free from defects in workmanship and materials for the number of years shown on the invoice. Under this extended warranty, Mindray will repair or replace any defective component at no charge for labor and/or materials. This extended warranty does not cover consumable items such as (but not limited to) batteries, displays, external cables and sensors.

Recommended preventative maintenance, as prescribed in the Service Manual, is the responsibility of the user, and is not covered by this warranty.

Except as otherwise provided herein, the terms, conditions and limitations of Mindray's standard warranty will remain in effect.

Mindray warrants that its products will be free from defects in workmanship and materials. This warranty does not cover consumable items such as, but not limited to, batteries, external cables, sensors, cuffs, hoses, or mounts.

Mindray will not be liable for any incidental, special, or consequential loss, damage, or expense directly or indirectly arising from the use of its products, liability under this warranty and the buyer's exclusive remedy under this warranty is limited to servicing or replacing at Mindray's option at the factory or at an authorized Distributor, any product which shall under normal use and service appear to the Company to have been defective in material or workmanship.

No agent, employee, or representative of Mindray has any authority to bind Mindray to any affirmation, representation, or warranty concerning its products, and any affirmation, representation or warranty made by any agent, employee, or representative shall not be enforceable by buyer.

This warranty is expressly in lieu of any other express or implied warranties, including any implied warranty or merchantability or fitness, and of any other obligation on the part of the seller.

Damage to any product or parts through misuse, neglect, accident, or by affixing any non-standard accessory attachments or by any customer modification voids this warranty. Mindray makes no warranty whatever in regard to trade accessories, such being subject to the warranty of their respective manufacturers.

A condition of this warranty is that this equipment or any accessories which are claimed to be defective be returned when authorized, freight prepaid to Mindray DS USA, Inc., Mahwah, New Jersey 07430, Mindray's agents or Mindray service centers in your region. Mindray shall not have any responsibility in the event of loss or damage in transit.

Calibration may be performed without the need to disassemble the instrument. It is the responsibility of the purchaser to perform calibration as necessary, in accordance with the instructions provided in this manual.

8.2 Phone Numbers and How To Get Assistance

A network of service representatives and factory-trained distributors is available. Prior to requesting service, perform a complete operational check of the instrument to verify proper control settings. If operational problems continue to exist,

- In North and South Americas, contact the Service Department at (800) 288-2121, ext: 8116 for Technical Support or (201) 995-8000 for assistance in determining the nearest field service location.
- In areas other than North and South Americas, contact Mindray's agents or Mindray service centers in your region. If Mindray service centers are not available in your region, please contact the Customer Service of Mindray headquarters in Shenzhen at (86) 755 26582492 or (86) 26582888 for technical support or assistance.

Please include the instrument model number, the serial number, and a description of the problem with all requests for service.

Warranty questions should be directed to a local representative. A list of offices, along with their phone numbers, is provided at the end of this manual.

8.3 Manufacturer's Responsibility

Mindray is responsible for the effects on safety, reliability, and performance of the equipment only if:

a. assembly operations, extensions, readjustments, modifications or repairs are carried out by persons authorized by Mindray; and

b. the electrical installation of the relevant room complies with the appropriate requirements; and

c. the equipment is used in accordance with the instructions for use.

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PT. Mindray Medical Indonesia • Menara Dea 1, Suite 301, Kav E4 No.3/1, Mega Kuningan, Jakarta Selatan12950 • Indonesia • Tel: (62-21) 576-2650 • Fax: (62-21) 576-2655

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Mindray Medical Brazil Limited • Rua Joaquim Floriano, 488, floor Intermediário - cj 02, Itaim Bibi, São Paulo -SP, CEP 04534-002, Brazil • Tel: (55-11) 3078-8026 • Fax: (55-11) 3078-8035

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